MEASURING THE RELATIVE COMPETITIVENESS OF GLOBAL DECIDUOUS FRUIT SUPPLY CHAINS: SOUTH AFRICA VERSUS CHILE

TEBOGO EDWIN MASHABELA

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Supervisor: Prof. N. Vink

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature---------- **Date**----------

"In today's business, the competition will bite you if you keep running; if you stand still they will swallow you".

William Knutsen, Jr. (Chairman, Ford Motor Company)

SUMMARY

The South African deciduous fruit industry is influenced by a number of factors including increased globalisation of markets, trade liberalisation, advances in information technology and consumer preferences. These factors have a continuous effect on the competitiveness of the industry and force deciduous fruit producers and processors to position themselves as capable competitors in the global free-market environment. This study measures the competitiveness of the South African deciduous fruit supply chains relative to those of Chile in an attempt to address the following research question: What is the relative global competitive advantage of the South African deciduous fruit supply chains relative to those of Chile?

To adequately address this research question, data from the Food and Agricultural Organisation of the United Nations (FAO, 2005) is used to examine the competitiveness of the supply chains. Three internationally recognised indexes are also used to calculate the comparative and competitive advantages of the deciduous fruit supply chains, namely, the Net Export index (NX_i), Revealed Comparative Advantage (RCA#) index and the Relative Revealed Comparative Trade Advantage (RTA) index.

The results clearly show that South Africa's deciduous fruit supply chains have a marginally relative competitive advantage, with most of the deciduous fruit products having RCA# and RTA index values situated around 0 to 10. The analysis shows that the South African deciduous fruit industry is struggling, with a marginal global comparative and competitive advantage in terms of its value added products. Chile, on the other hand, has a relatively better revealed comparative advantage as well as a higher relative global competitive advantage in most of the deciduous fruit supply chains. South Africa has a relatively better global comparative advantage and competitive advantage over Chile only in apple juice and dried apricots. Despite South Africa's marginal competitiveness, most of

the deciduous fruit supply chains are experiencing an upward competitiveness, which is not the case for Chile.

The results also reveal that the competitiveness of most of the deciduous fruit supply chains in South Africa, except for the apple and apricot chains, decreases from primary to processed products which implies that value-adding opportunities are still limited or untapped. On the basis of these findings, this study makes an attempt to identify and discuss some of the factors that affect the competitiveness of the industry by using a framework of competitive advantage analysis proposed by Porter (1990, 1998). The most important factors that impact on the competitiveness of the South African deciduous fruit industry are availability of skilled labour; cost and quality of unskilled labour; availability and quality of capital; cost of technology; local market growth; threat of substitutes; land reform policy; labour legislation; current exchange rate (current strength of the rand); BEE policy; lack of timely and accurate information and the inaccuracy of some of the data of the Perishable Products Export Council Board (PPECB); continued agricultural subsidies received by growers in countries competing with South Africa in global markets; and the high incidence of HIV/AIDS and crime. In order for the industry to enhance its competitiveness, a number of strategies to be adopted by all participants in the supply chain are suggested at the end of this study.

OPSOMMING

Die Suid Afrikaanse sagtevrugte bedryf word beïnvloed deur verskeie faktore insluitende groter wordende internasionale market, handels liberalisering, vooruitgang in inligtings tegnologie en verbruikers voorkeure. Hierdie faktore het ‘n voordurende effek op die mededingendheid van die bedryf en dwing die sagtevrugte produsente en produseerders om hulself te posisioneer as bekwame mededingers in die internasionale mark omgewing. Hierdie study meet die mededingendheid van die Suid Afrikaanse sagtevrugte voorsieningsketting relatief tot die van Chili in ‘n poging om die volgende navorsingsvraag te beantwoord: Wat is die relatiewe internasionale mededingende voordeel van die Suid Afrikaanse sagtevrugte voorsieningsketting relatief tot die van Chili.

Om die navorsingsvraag na behore te beantwoord word inligting van die Voedsel en Landou Organisasie (Food and Agricultural Organization, FAO) van die Verenigde Nasies van 2005 gebruik om die mededingendheid van die voorsieningskettings te verduidelik. Drie internasionaal erkende indekse word gebruik om die vergelykende en mededingende voordele van die sagtevrugte bedryf voorsieningskettings te vergelyk naamlik die Netto Uitvoer indeks (NU), Openbare Vergelykende Voordeel (OVV) indeks en die Relatiewe Openbare Vergelykende Handels Voordeel (ROVHV) indeks.

Die resultate wys duidelik dat Soud Afrika se sagtevrugte voorsieningsketting ‘n relatief marginale kompeteerdende voordeel het, met meestse van die sagtevrugte produkte met OVV en ROVHV indeks waardes van tussen 0 en 10 het. Die ontleedings toon aan dat die Suid Afrikaanse sagtevrugte bedryf dit moeilik vind met om internasionall mededingend te wees met slegs ‘n maginale internasionale vergelykende en mededingende voordeel in terme van waarde toegevoegde produkte. Anders as Suid Afrika het Chili ‘n relatief beter openbare vergelykende voordeel as ook ‘n beter relatiewe internasionale vergelykende voordeel in meeste van die sagtevrugte voordieningskettings as Suid Afrika. Suid Afrika het slegs relatiewe beter internasionale en mededingende voordele in appelsap en gedroogde appelkose as Chili. Ongeag Suid Afrika se marginale mededingendheid ondervind meeste van die voordieningskettings opwaartse mededinging wat die die geval is met Chili nie.

Die resultate het ook gewys dat die mededingendheid van meeste van die sagtevrugte voorsieningskettings in Suid Afrika afneem van primere na vervaardigde produkte, behalwe vir die appel en appelkoos waardekettings, wat impliseer dat waardetoevoeging moontlikhede steeds baie beperk is of nog nooit ontgin is nie. Op basis van die bevindinge is ‘n poging aangewend om sommige van die faktore wat die mededingendheid van die bedryf affekteer te identifiseer en te bespreek deur gebruik te maak van die raamwerk van mededingende voordeel ontleedings soos voorgestel deur Porter (1990, 1998). Die mees belangrike faktore wat ‘n inpak het op die mededingendheid van die van die bedryf is die beskikbaarheid van opgeleide arbeid; die koste en kwaliteit van onopgeleide aerbeid; beskikbaarheid en kwaliteit van kapitaal; koste van tegnologie; groei in plaaslike mark; gevaar van substitute; grondhervormings beleid; arbeids wetsgewing; huidige wisselkoers (huidige sterkte van die Rand); swart bemagtigings beleid; tekort aan tydige en akkurate inligting en die onakkuraatheid van sommige data van die Bederfbare Produkte Uitvoer Raad; landbou subsidies aan produsente in lande waarmee Suid Afrika internasionaal meeding en die hoë voorvalle van HIV/AIDS en misdaad. Om mededingendheid binne die berdyf te verbeter word verskeie strategie voorgestel wat rolspelers in die bedryf kan implementer.

DEDICATION

This thesis is a tribute to those who directly or indirectly contributed towards its successful completion, but it is mainly dedicated to my late father, Kgaodi Jan Mashabela and my mother Raesetja Jeminah Mashabela, for their unselfish devotion and sacrifice towards my educational expedition. May this work be a source of inspiration to my son, Vhuhwavho Tebogo Jnr.

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GOD IS GREAT

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CHAPTER ONE: INTRODUCTION

1.0 Background

The South African deciduous fruit industry began by providing fruits to the local market, but as it developed, it supplied an international market as well. Prior to 1800, deciduous fruit was produced on a small scale only for the local market. The export of fresh deciduous fruit dates back to 1892 when fruits were shipped to Great Britain. After World War II exports started to grow, and during that time the deciduous fruit industry started its dramatic growth (Du Toit, 1981). Today, the industry is internationally important as an exporter of fresh deciduous fruits, generating over R4,6 billion a year in export earnings (Meyer and Breitenbach, 2004).

Deciduous fruit is classified under three categories, namely grapes, pome fruits (apples and pears) and stone fruits (apricots, nectarines, peaches and plums). According to the Deciduous Fruit Producers Trust (DFPT, 2005), there are approximately 2930 (1255 stone fruit producers, 914 table grape producers and 761 pome fruit producers) deciduous fruit producers in South Africa, concentrated mostly in the Western Cape and Northern Cape provinces. Other production areas include the Eastern Cape, Limpopo, Free State and Mpumalanga provinces.

The structure of the industry comprises producers, different primary fruit associations, namely, the South African Apple and Pear Producers' Association (SAAPPA), South African Table Grapes (SAT), the South African Stone-fruit Producers' Association (SASPA), DFPT Research Management, Dried Fruit Technical Service (DFTS) and the Deciduous Fruit Producers' Trust (DFPT), which is the umbrella organisation of the industry.

The industry contributes significantly to the wellbeing of the South African population, directly and indirectly, through its forward and backward economic linkages (Jooste, 2004). It exports fruit to international markets, and in return, earns foreign currency that is important for South Africa as a developing country. It contributes to the economy by

creating employment and generating revenue. The role it plays is significant in terms of the employment opportunities created as well as the number of dependants supported by the workers in this industry. An industry survey revealed that there are 99,778 on-farm workers employed by the industry, including casual labour on farms and 399,110 dependents (OABS, 2005).

The industry is important to the South African economy, and therefore, its competitiveness is a matter of concern. The industry has seen some dramatic changes over the past few years, moving from a wholly regulated market environment towards a free-market system in a global environment. According to De Vos (2003), these dramatic changes have affected the competitiveness of the supply chain. Prior to deregulation, which took place in 1997, single-channel export marketing was used for most of the commodities, making it relatively simple and relatively easy to manage and optimise the supply chain.

1.1 Problem statement

There is no doubt that the South African deciduous fruit industry has gone through tough times in the past few years. Indeed, most deciduous fruit producers have suffered from the following factors: increased global competition, particularly from Chile; changes in consumer preferences; and over-supply of fresh deciduous fruit in South Africa's traditional markets. South Africa has, in addition, experienced a range of new labour legislation, enacted since 1993, and the deregulation of the industry. Global deciduous fruit markets are becoming more sophisticated and competitive.

The deciduous fruit industry is currently going through a process of major transformation. The pressures for change are coming from multiple directions. Deciduous fruit is increasingly exported through a global value chain dominated by large supermarket buyers and their agents. This is continually going through technological and organisational restructuring with increasing demands for higher standards. Global competition between southern countries exporting into a tight world market is intensifying.

According to Estherhuizen and Van Rooyen (2001), agribusinesses in South Africa are experiencing increasing pressure because of globalisation, making it more important for agricultural industries to have a relative competitive advantage. Changes in the South African trading regime as well as changes in forces that affect global markets for agricultural products are forcing deciduous fruit producers and processors to position themselves as capable competitors in the global free-market environment. The current trends relating to the globalisation of markets, trade liberalisation, advances in information technology, consumer preferences and improved logistics are exerting pressure on industries worldwide to become more competitive. This is also the case for the South African deciduous fruit industry.

With global deciduous fruit markets becoming more competitive and the local industry largely being deregulated, the South African deciduous fruit industry, one of the least subsidised in the world, is thus consistently challenged to increase its competitiveness if it is to survive in the long run. Efficiency is even more important given that South Africa's foreign competitors have high levels of government subsidies and protection measures, putting South African producers and processors at a definite disadvantage.

The future survival and growth of the domestic industry, therefore, depends largely on its ability to surpass the competitiveness of its rivals, particularly Chile. Chile is the world's biggest producer of deciduous fruits and South Africa's biggest competitor in most of South Africa's important export destinations, namely the European Union (EU), United Kingdom (UK), United States (US) and the Far East markets. Being more competitive than Chile is critical for the long-term survival of the industry.

The competitiveness of the industry is largely influenced by the performance of supply chains. Currently, questions are being asked by local industry about the industry's supply-chain competitiveness relative to that of Chile. Therefore, a need is justified to measure and compare the domestic industry supply chain's competitiveness relative to that of Chile. Measuring the relative competitiveness of the industry supply chain will give a good indication of the success of the industry.

The central question to be addressed in this study is, therefore, What is the extent to which the South African deciduous fruit industry supply chain is competitive relative to that of Chile?

1.2. Objective of the study

The primary objective of this study is to investigate, measure and compare the relative competitiveness of the South African deciduous fruit supply chain to that of Chile in an attempt to improve efficiency so that opportunities that exist can be exploited. The research question, What is South Africa's deciduous fruit supply chain competitive status relative to that of Chile? needs to be answered. Achievement of the objective, therefore, lies in answering this question.

In order to reach the primary objective, several secondary objectives need to be met. These include:

- obtain an overview of the current production and trade situation of the South African and Chilean deciduous fruit industries;
- apply analytical techniques to measure the comparative and competitive advantages of the deciduous fruit supply chains;
- analyse the revealed comparative and relative competitive advantages of the deciduous fruit supply chains of South Africa and Chile;
- make recommendations in terms of how the relative competitiveness of the South African deciduous fruit industry can be improved.

1.3. Need for the study

The long-term success of agricultural industries in today's changing business environment is determined by the competitiveness of their supply chains, and this cannot be ignored any longer. From the propositions made by Ricks *et al*. (1999), Ross (1998), Cooper (1994), and Nitschke & O' Keefe (1997), it is evident that the measurement of supply chain competitiveness is important today because of the increased globalisation of agricultural markets.

Zuurbier (1999) argues that supply chains and networks are expected to determine the structure of the food and agribusiness industry in the next decade, and these will affect the relative competitiveness of the industries. Based on the work of the agribusiness experts in Europe and the USA, it is now being argued that a supply chain focus on competitiveness is necessary (Zuurbier, 1999 and Soler & Tangury, 1998). Therefore, the supply chain competitiveness of the South African deciduous fruit industry is critical for the long-term survival of the industry, particularly when one looks at the deregulation process that has occurred in the industry in the past decade. Furthermore, due to the changing political, legal, regulatory and business environments (i.e. the need for Black Economic Empowerment policy and the need to transform) that influence the way supply chains operate, research is justified to investigate and compare the relative competitiveness of the industry to its competitor, namely, Chile. The purpose of this study is, therefore, to measure the relative competitiveness of the industry's supply chains and compare these to those of Chile. The research will provide insight into the future prospects of the domestic industry.

Why do we need to compare the competitiveness of South African deciduous fruit supply chains with those of Chile? First, South Africa and Chile enjoy the same counter-seasonal advantage to access developed-country markets, particularly the EU, UK, US and Far East. Second, the Chilean deciduous fruit industry constitutes a major competitive force in South Africa's export destinations, namely the EU, UK, US and Far East markets. Thus, a comparison of these two countries will present a realistic picture of South Africa's future prospects in the EU, UK, US and Far East markets. A comparative study on competitiveness between these two countries will thus provide valuable information and intelligence in an era when bilateral trade relations are becoming increasingly important. It is further necessary to compare South African deciduous fruit industry performance post-deregulation with that of its main competitors in the Southern Hemisphere, Chile in this case.

1.4. Research methodology and data used

The study attempts to assess the comparative advantage and competitiveness of the South African deciduous fruit industry relative to that of Chile, following the quantitative approach of Balassa (1965) and the qualitative approach of Porter (1990). In an effort to

analyse the comparative advantage and competitiveness of the South African and Chilean deciduous fruit industries' supply chains, three internationally recognised and innovative techniques, i.e. the Revealed Comparative Advantage (RCA#) index, the Net Export index (NX_i) and the Relative Revealed Comparative Trade Advantage (RTA) index were employed. The RCA# index and NX_i index were used as complementary measures, while the RTA index was used independently to measure and explain the current state of affairs. For the analysis, considerable use was made of secondary data already generated, such as data from the Food and Agricultural Organisation of the United Nations (FAO, 2005).

The research methodology used in this study closely resembles that of a cluster study. This entails, among other methods, the use of a questionnaire (see Appendix A) to gather information regarding the competitive potential of the South African deciduous fruit industry from different organisations within the industry. It was necessary to administer a questionnaire to gather information for the description of why the competitiveness of the industry is marginal compared to Chile. The questionnaire was designed according to Porter's method (1990, 1998) to ensure that an accurate picture of the current state of affairs is reflected in terms of factors influencing the competitiveness of the industry. Primary data were obtained through postal, electronic (e-mail and fax) and personal surveys.

1.5 Demarcation of the study

This study compares only the competitiveness of the South African and Chilean deciduous fruit [grapes, pome fruits (apples and pears) and stone fruits (apricots, nectarines, peaches and plums)] supply chains.

1.6. Outline of the Study

The remainder of the study is divided into the following chapters:

- Chapter Two reviews the relevant literature on supply-chain competitiveness analyses. The chapter starts by defining comparative advantage and competitiveness.

- Chapter Three provides a descriptive overview of the South African deciduous fruit industry.

- Chapter Four provides a descriptive overview of the Chilean deciduous fruit industry.

- Chapter Five discusses, in detail, the research methodology used in the study.

- Chapter Six gives the description and interpretation of the research results. It is in this chapter that the revealed comparative advantage as well as the relative competitive performance of the South African and Chilean deciduous fruit industries is analysed and compared. The chapter concludes by looking at underlying reasons for the marginal relative competitiveness of the South African deciduous fruit industry.

- Chapter Seven gives conclusions and recommendations, and this chapter also serves as the culmination of the study.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

Supply chain literature has evolved from several subject areas and can be studied from many perspectives, such as agriculture, economics, sociology, engineering and management. Supply chain literature from an agricultural perspective focuses on all activities and processes involved in bringing products from seed to table, including the provision of product attributes such as taste and quality.

In today's ultra-competitive agricultural world, the competitive supply chain of agricultural products is perhaps the only sustainable competitive advantage for most agricultural businesses or industries. According to Porter (1990), the productivity of a nation is the most important factor of competitiveness, but this is not all that is needed to make a nation globally competitive. Dunne (2001) contends that there is no doubt that the competitive environment in which agribusiness firms operate has changed. Handfield and Nichols (1999) also concur that we have entered a new era in understanding the dynamics of competitive advantage and the role played by supply chains and procurement. Dunne (2001) identified supply chain management as an important way to help improve the competitiveness of agricultural industries.

Recently, supply chain analysis has become a rapidly evolving area of interest for agricultural researchers in South Africa. This is evident from the increasing number of studies that have been and are being conducted in this field. The purpose of this chapter is, therefore, to review the literature on agricultural supply chain competitiveness analyses by giving a brief summary of studies already done in this field. The chapter starts with the definition of comparative advantage and competitiveness. The definition of supply chains from an agricultural perspective then follows. The summary of studies on supply chain analyses in South Africa, including the various techniques and methods used, with an emphasis on their results, is discussed in the last section before the chapter is concluded.

2.1 Comparative advantage and competitiveness defined

Comparative advantage and competitiveness are important concepts central to economic theory. The concepts of comparative advantage and competitiveness are the two most important foundations for understanding the importance of international trade, particularly in agriculture, and to clarify the underlying factors responsible for current trade patterns.

There is much confusion between the use of the terms comparative advantage and competitiveness in economics. The concepts are related but often mistakenly exchanged for each other. Understanding the meaning of these two terms is vitally important when one endeavours to use the various different measures that are available to measure a country or industry's competitiveness. It is for this reason that these concepts are discussed in more details in this section.

According to Lipsey *et al*. (1993) comparative advantage refers to the ability of one nation to produce a commodity at a lesser opportunity cost of other products forgone than another nation. Comparative advantage explains how trade could benefit nations by more efficient use of the world's resource base (i.e. land, labour and capital inputs) when that trade is totally unrestricted, i.e. a free market environment or at least when 'an equal playing field' exists. In other words, comparative advantage indicates whether it is economically advantageous to expand the production and trade of a specific commodity. Kannapiran and Fleming (2000) argue that comparative advantage is a concept that applies to inter- and intra-industry comparisons within a country in the traded goods sector but that it is inappropriate for inter-country comparisons.

Although there is general consensus on what defines comparative advantage, there is little consensus on what defines competitiveness, despite the fact that the term has generated a great deal of debate. International competitiveness is a much-used phrase, the meaning of which is not always clear. The Organisation for Economic Co-operation and Development (OECD, 2004) states that competitiveness is a dynamic concept that is strongly influenced by the macroeconomic and regulatory environment, with producers and processors in a continuous "treadmill" in the market place. The literature on competitiveness supplies a wide variety of definitions of the term, and there is in fact no single definition of the term in economic literature. The difficulties in defining

competitiveness derive from the various dimensions of this concept. However, some authors have defined competitiveness and it seems their definitions have been widely accepted in economic literature.

The OECD (2002) defines competitiveness as the degree to which a nation can, under free trade and fair market conditions, produce goods and services that meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long-term. Frohberg and Hartman (1997), on the other hand, define competitiveness as an indicator of the ability to supply goods and services at the location, in the form, and at the time sought after by buyers, at prices that are as good as or better than those of potential suppliers, while earning at least the opportunity costs of returns on resources employed. Thus a competitive firm, industry or country has the ability to satisfy consumers with a product of the right price, right quality, right packaging, etc. creating place, time and form utility.

Warr (1994) defines competitiveness as an indication of whether a firm, industry or country could successfully compete in the trade of a commodity in the international market, given existing policies and economic structure. Worley (1996) emphasis that the term competitiveness explains existing trading patterns as they operate in the real world, including all the barriers to free trade, i.e. policy effects, product quality differences and the industry marketing skills which are ignored by comparative advantage.

Ortmann (2000) and Fafchamps *et al*. (1995) define competitiveness as the ability of a firm or a country to produce a commodity at an average variable cost below its price. However, Porter (1998) states that the fact that a country has good production factors no longer makes it competitive, and this is mainly because of technology. Technology lets industries operate in a more sophisticated way and creates new alternatives. Spies (1999) concurs by stating that “competitiveness implies superior performance in productivity growth – especially in multi-factor productivity, which is best reflected in the effective rate of technological innovation in an economy”.

Warr (1994) summarises the definitions of comparative and competitive advantage, and according to him, comparative advantage refers to the ability of one nation to produce a commodity at a lower opportunity cost than another nation, while competitive advantage

indicates whether a firm could compete successfully in the trade of a commodity in the international markets, given existing policies and economic structure. Khemani (1997) notes that comparative advantage can form the basis for building competitive advantage.

Ortmann (2000) argues that competitiveness and comparative advantage are closely related. According to Cordon (1974) and Kannapiran and Fleming (2000) competitiveness and comparative advantage would be the same in a world of perfect competition in which there are homogenous products, perfect information and an absence of market failure. However, in the real world the two typically differ because of distortions in inputs and product marketing systems. The only difference between the two is that competitiveness includes market distortions whereas comparative advantage does not. Competitiveness is thus determined by the commercial performance of individual firms or industries, whereas comparative advantage is about the efficient allocation of resources at the national level, especially among sectors of the economy producing traded goods and services.

In this paper competitiveness is, therefore, conceptualised as the ability of the industry to trade and exchange products on a sustainable basis at competitive prices within the global environment (Porter, 1990 and Balassa, 1989). Thus, imports and exports will be included in the determination of competitiveness. Short-term features, such as opportunistic 'price-wars', will not influence matters greatly.

2.2. Summary of the historical development of competitiveness

Competitiveness has a long history. This section gives a synopsis of the historical development of competitive advantage. Some of the key elements of the historical development of economic thought in the area of competitiveness are given in Table 1 below.

The classical political economy: Much of established international trade theory is embedded in the writings of classical economists, notably Adam Smith (1723-1790), David Ricardo (1772-1823) and John Stuart Mill (1806-1873). The central conclusion of these authors' work is that, although there are exceptions, almost all countries can reach their highest possible levels of income and economic growth by maintaining an open international trade policy. The classical economists noted that domestic production and

consumption should be guided by the prices at which foreigners are willing to trade. They emphasised that rather than focusing on restricting trade, governments should focus on maintaining competitive national markets and invest in public goods such as research and education (Masters, 1995).

Neoclassical models: The greatest contribution of the neoclassical models is the identification of the sources of comparative advantage and specialisation, or the reasons why one industry can profitably expand while others cannot. Without such explanations for the rise and fall of major industries, it could be argued that the theory of learning-by-doing (i.e. experience) is the only real source of comparative advantage. Neoclassical economists stated that only trade restrictions to kick-start industries could create comparative advantage. Neoclassical models quantify five broad contributors to an industry's comparative advantage, namely, technological efficiency, factor-intensity of different industries, industry-specific resources, domestic demand and exchange rates (Masters, 1995).

Challenges to comparative advantage: Challenges to Neoclassical views of comparative advantage have come in two broad ways, one focusing on developing countries, starting around 1950, and another centred on industrialised countries, starting in the early 1980s. Both challenges have been associated with periods of rapid changes in production and trade levels, and demands for government interference to support vulnerable industries. But a major difference is that most non-neoclassical theories for developing countries argued in favour of restricting imports to avoid dependency on others, while the corresponding theories for industrial countries argued for supporting exports with strategic-subsidies to capture market share (Masters, 1995). These views led Balassa (1977) and Porter (1990) to develop analytic frameworks that address competitive factors.

Table 1: Summary of the foundations of competitive analysis

THEORIES	KEY CONCEPT(S)	MECHANISM(S)
CLASSICAL POLITICAL ECONOMY:		
Adam Smith (1776)	Market size/productivity	Specialisation
David Ricardo (1817)	Comparative advantage	Competition
J.S. Mills (1848)	Infant industries	International trade
J.S. Mills (1873)	Politics of protection	Learning-by-doing
		Income distribution
NEOCLASSICAL MODELS:		
Ricardian (1817)	Technical efficiency	Use of a single key resource
Heckscher-Ohlin (1919, 1933)	Factor-intensity	Use of more than one resource
Ricardo-Viner (1937)	Specific factors	Use of industry-specific inputs
Heckscher-Ohlin-Samuelson (1962)	Consumer demand	Product preference
Salter-Swan (1959, 1960)	Exchange rates	Non-traded goods, inflation
CHALLENGES TO COMPARATIVE ADVANTAGE:		
Presbisch/Singer (1950)	Import substitution	External terms of trade
A.O. Hirchman (1958)	Development strategy	Inter-industry linkage
New trade theorist	Strategic policy	Rent-shifting, externalities
Michael Porter (1990), Balassa (1977)	Competitive advantage	Factor creation, demanding, signalling

Source: Masters, 1995

2.3 Supply chain defined

Much research has been conducted on supply chains, and the term has been defined in many ways. The many definitions tend to confuse many researchers. According to Mentzer *et al*. (2001), the alternative definitions and categories of supply chain imply that the term presents a source of confusion for those involved in researching it.

To most readers, supply chain still implies working with suppliers, yet it involves more than working with suppliers. Chopra and Meindi (2001) note that supply chain not only includes the manufacturers and suppliers, but also transporters, warehouses, retailers, and customers themselves.

Christopher (1992) defines a supply chain as a network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that

produce value in the form of products and services in the hands of the ultimate consumers. Darroch (2001) defines a supply chain as activities associated with the flow and transformation of goods from raw material stage (extraction), through to the end user, including associated information flows.

From an agricultural point of view, a supply chain can be defined as all activities and processes involved in bringing products from seed to the table, including the provision of product attributes such as taste and quality. Shank and Govindarajan (1993) note that the definition of supply chain is similar to that of value chain, except that the basis of supply chain is logistics[1].

Figure 1 illustrates Porter's value chain. Porter (1985) contends that a firm's ability to create superior value for its customers and its competitive advantage are determined by how successful it is in merging its support and operational activities.

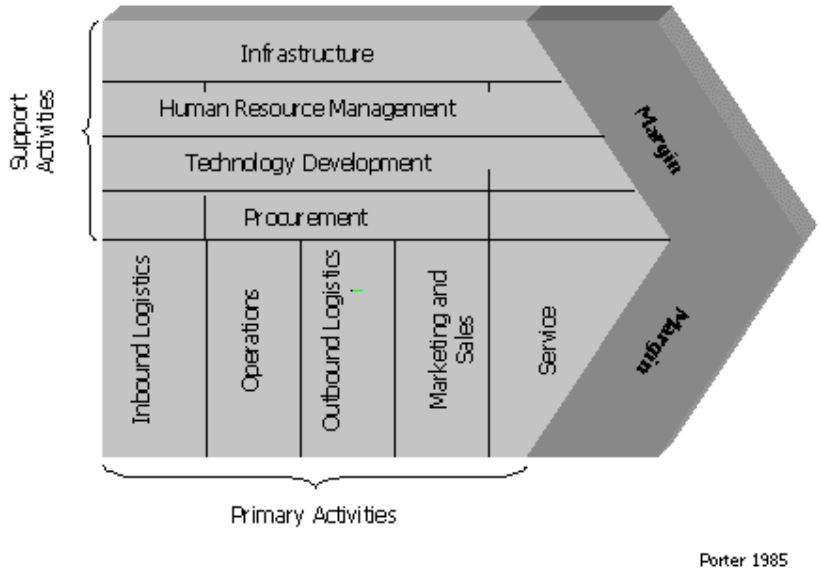


Figure 1: Porter's value chain

Source: Porter (1985)

[1] Logistics is the part of supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customers' requirements. According to the Council of Logistics Management (2002), logistics is a subset of supply chain management.

According to Porter (1985), the primary activities of the value chain include:

- Inbound logistics - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.
- Operations - all the activities required to transform inputs into outputs (products and services).
- Outbound logistics - include all the activities required to collect, store, and distribute the outputs.
- Marketing and sales - all activities that inform buyers about products and services, induce them to purchase these products and services, and facilitate their purchases.
- Service - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Support activities include:

- Procurement - the acquisition of inputs, or resources, for the firm.
- Technological development - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.
- Human resource management - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.
- Infrastructure - serves the company's needs and ties its various parts together. This consists of functions or departments, such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.

Different industries have different supply chain structures, and the main elements of a supply chain vary by industry and over time. In this study, supply chain is conceptualised on the basis that it includes business transactions between all production processes – from the farm, past the farm-gate to processing, manufacturing, retailing and right up to serving the end consumers.

2.4. Supply chain management defined

Most of the researchers still construe supply chain and supply chain management to be the same. In differentiating the two Christopher (1998) defines supply chain management as "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole". Christopher's (1998) definition has been adopted widely by many researchers. Koch (2002) defines supply chain management as a combination of art and science that goes into improving the way a company finds the raw components it needs to make a product or service, manufactures that product or service and delivers it to customers. According to Balsmeier and Voisin (1996), supply chain management is a strategy that integrates various organisations' objectives in order to increase the efficiency of the entire supply chain.

The objective of supply chain management is, therefore, to improve the coordination and performance of production and marketing systems (Ricks *et al*. 1999). Spaulding and Woods (2003) contend that coordinating efforts through supply chain management will enable firms to meet customer wants cheaper, faster and better, thereby achieving the desired financial performance. Braithwaite (2002) notes that the value of supply chain management always starts with customers. According to Copacino (1996) and Spaulding and Woods (2003), when all functional areas in the supply chain management work together - including suppliers, manufacturers, distributors and customers - they can benefit by enhancing performance significantly across the board by increasing revenues, controlling costs and achieving customer satisfaction.

2.5 The evolution of the supply chain

The evolution of the supply chain appears to be one of the most powerful business strategy concepts in today's ultra-competitive agricultural world. Although the literature on the supply chain in agriculture is fairly recent, the concept has been used in the manufacturing and logistics fields for many years (Westgren, 1998). The economic foundation of the supply chain dates back to 1937 in Coase's (1937) groundbreaking paper on the nature of the firm. Supply chain development can also be traced back to the rise of modern logistics. Ross (1998) argues that, though the supply chain represents a

radically new approach in the search for significant breakthroughs in products and markets, it is closely connected with logistics and is in many ways a product of changes that have taken place in logistics.

Today, analyses of the supply chain is popular with many agricultural researchers; this is shown by the increasing number of studies in this field. It rose to popularity in the late 1980s and came into widespread use in the 1990s. It evolved as a discipline during the late 1980s as managers started to apply just-in-time principles to materials management and quick response principles to distribution processes (Fernie, 1994). In the early 1990s it came into widespread use as industries realised they could no longer compete independently but required the co-operation of their supplier and customer partners.

The factors that led to the evolution of the supply chain as a strategy for competitiveness are: first, academics, researchers and managers came to realise that the supply chain could serve as a way to improve the effectiveness of communication and coordination between functional areas within companies (Wysocki, 2000); second, the supply chain evolved because of natural consequences of advances in technology, in particular information technology; third, changing tastes and preferences of consumers; and fourth, increased trade liberalisation and globalisation. The increasing globalisation of the food sector, retail concentration and the changing social concerns and lifestyle of consumers also led to the evolution of the supply chain as a strategy for competitiveness.

Ortmann (2001) in his paper “The industrialisation of agriculture and the role of supply chains in promoting competitiveness” argues that changing consumer demands, new technologies and increasing competition have caused major structural changes in the agro-food sector, and this led to the development of the supply chain as a strategy to promote competitiveness. Christopher and Juttner (2000) and Ramcharran (2001) also argue that an increase in competitive pressure in the business environment has resulted in the supply chain emerging as the crucial component of new competitive strategy models.

2.6 The rationale for the supply chain in agriculture

As agricultural industries strive to create better value for their customers in today’s ultra-competitive agricultural world, agricultural researchers are beginning to realise the

important role the supply chain plays in achieving competitive advantage. The supply chain is crucial in agriculture because it offers new ways to compete in new markets and it provides previously unattainable levels of service. It is a powerful tool to achieve competitiveness and it is of utmost important for the competitiveness of the industry. Effective, efficient and competitive supply chains improve profitability and investment. Value will be lost if the supply chain is not functioning in an effective and efficient manner.

Zuurbier and Trienekens (2000) present the following rationale for the supply chain in agriculture. They state that, first; the supply chain is needed for increased co-ordination so that costs are cut to counter intensive competition. Second, the supply chain is needed in agriculture to mobilise all the competencies in order to introduce new products and to reduce the time-to-market of these products, as well as to ensure a year-round supply of products. The supply chain is important in agriculture because it stabilises returns and prices and also creates the economies of scale needed for successful competitive advantage. Third, the supply chain is justified in agriculture because of increasing consumer interest in, and demand for safe and healthy foods. A successful supply chain takes into account the final consumers and their needs. In order for the industry to become competitive in the modern competitive economy, the entire supply chain must achieve high performance in effectively serving the needs of its customers.

Ricks *et al*. (1999) summarise a number of common supply chain needs from the perspective of an agricultural commodity industry. These include:

- Analysis of the industry's primary customers' needs, the value chain, and hence, opportunities for market expansion by the industry through the more effective servicing of changing customer needs.
- Acquisition of continually updated information on the preferences, needs, and requirements of the industry's customers.
- Production and supply of adequate quality products to the industry's customers, and development and adaptation of new varieties, new products, and new uses of the industry's products for changing customers' needs.
- Development and expansion of export markets by meeting the special requirements of these markets in various exporting countries.

Competition between nations' supply chains has become more important than competition between individual sub-sectors within a supply chain with those of other countries. Therefore, in today's ultra competitive agricultural world, supply chains play an important role in achieving competitive advantage.

2.7 Review of South African agricultural supply chain competitiveness analyses

There have not been many studies of importance on issues dealing with the economics and movement of agricultural and food products from the farm to the final consumers - supply chain analyses - in South Africa until recently. Supply chain analysis has just gained commercial credence in the last ten to twenty years as many agricultural researchers started to realise its importance to the agricultural sector. It has gained popularity as evidenced by the increase in the number of studies that have been, and are being conducted. According to Martinez (1996), this is because of the significant changes that are currently affecting the agricultural sector, such as the shift in consumer demand, global competition, technological progress and the industrialisation of agriculture.

Agricultural supply chain analyses have been undertaken on both the micro- and macro-levels, and these include analyses by Esterhuizen and Van Rooyen (1999); Esterhuizen and Van Rooyen (2001); Van Rooyen (1998); Van Rooyen *et al*. (2000) and Van Rooyen and Esterhuizen (2001), who used Balassa's (1989) Revealed Comparative Advantage (RCA) index method to analyse the competitiveness of the supply chains in the South African agricultural sector. The findings of their analyses are that most commodity chains are marginally competitive, and the competitive index generally decreases when moving from primary to processed products. They concluded that the analyses imply that value-adding activities in the South African agricultural sector are limited. The authors recommended that further research be undertaken into the reasons why supply chains are not competitive, such as lack of technological innovation, unproductive labour, high input costs, poor infrastructure and inappropriate government policy measures.

Jooste and Van Schalkwyk (2001) and Krabbe and Vink (2000) analysed the comparative advantage of primary dry land soybean production and the sugar industry in South Africa respectively using the Policy Analysis Matrices (PAMs) devised by Monke and Pearson (1989). Gronum *et al*. (2000) investigated comparative advantage of the primary oilseed

industry in South Africa using Domestic Resource Cost (DRC) and Kirsten *et al*. (1998) analysed the comparative advantage of commercial wheat production in South Africa using a variant of the Domestic Resource Cost. The general conclusion from the analyses done by these researchers is that South Africa has a comparative advantage in the production of these commodities. Although the analyses of comparative advantage done by these authors using these techniques is quite revealing, certain considerations need to be borne in mind. The underlying problem with the Policy Analysis Matrix (PAM) is that it is static in nature and generally focuses on the macroeconomic issues and thus fails to shed any information on micro-incentives, as does the Domestic Resource Cost (DRC).

Venter and Horsthemke (1999) studied the competitiveness of Southern Africa's sheep meat sector (supply chain) relative to the Australian industry using Porter's (1990) model of competitiveness (namely, the factor conditions; demand conditions; competitiveness of related and supporting industries; firms' strategies, structures and rivalry; and the role of government). Venter and Horsthemke's (1999) analysis support the above-mentioned findings of Esterhuizen and Van Rooyen (1999; 2001) that the competitiveness of the South Africa's agricultural supply chains decrease downstream. Their analysis found that the cost associated with value adding in the retail industry, which decreases the competitiveness of the total value chain, is much higher in Southern Africa than in Australia. Venter and Horsthemke (1999) concluded that the Southern African lamb producers were competitive but the mutton producers were not. They suggested that strategies to promote product demand and the formation of strategic alliances in the value chain (to improve information flow, risk management, quality assurance, etc.) could increase competitiveness, which they defined as the ability of a firm or industry to outperform rivals in the primary goal of profitability.

Blignaut (1999) used an integrated approach suggested by Porter (1985) to study the local and international competitiveness of the South African diary industry supply chain. Blignaut (1999) used two types of competitive advantage to analyse his study, being cost leadership (low cost production) and value adding (product differentiation). The latter is considered in terms of such factors as product safety and quality, marketing approach used and the back-up system. Blignaut's (1999) analysis shows that the competitiveness of the South African dairy industry supply chains decrease downstream. He concluded that South Africa's dairy farmers produce milk relatively effectively but the milk-processing

industry was not internationally competitive, which he ascribed to distorted international diary marketing.

Ortmann (2001) also studied the industrialisation of agriculture and the role of supply chains in promoting competitiveness. He concluded that there is a major challenge for institutions in South Africa to promote income growth and the competitiveness of small-scale farmers and their participation in value-adding supply chains.

Mosoma (2004) analysed the agricultural competitiveness and supply chain integration of South Africa, Argentina and Australia using the Relative Revealed Comparative Trade Advantage (RTA) index. His analysis shows that South Africa's agricultural food chains are marginally competitive internationally, whereas Argentina's and Australia's agricultural food chains are generally more competitive internationally than those of South Africa. His findings show that South Africa has managed to move further up the value chain compared to Argentina and Australia. He concluded that in all three countries competitiveness decreases when moving from primary to processed products in the chain, which implies that value-adding opportunities are limited in these countries. His results support Venter and Horsthemke's (1999); Blignaut's (1999) and Esterhuizen and Van Rooyen's (1999; 2001) findings that South Africa's agricultural competitiveness decreases when moving from primary to processed products in the supply chain. Mosoma (2004) recommended that a great deal of attention has to be given to creating value-adding opportunities through aggressive research and development of new products and production techniques.

Recently, Hallatt (2005) used three indexes, namely, the Revealed Comparative Advantage (RCA#) index, the Net Export Index (NXi) and the Relative Revealed Comparative Trade Advantage (RTA) index to analyse the relative competitiveness of the South African oilseed industry by comparing it with that of Argentina. Hallatt's (2005) analysis shows that South African groundnuts and sunflower seeds have a competitive advantage in their primary form, but she found that oilseed to which value has been added has, in most cases, a competitive disadvantage, exactly the opposite of Argentina's oilseed products. Her study revealed that the South African oilseed industry is struggling with comparative and competitive disadvantage for value-added products. These findings led Hallatt (2005) to analyse the competitiveness of the secondary oilseed industry, and

she found that the oilseed industry is price-driven. Hallatt (2005) then recommended that there should be innovations in sunflower oil production, effective marketing and distribution of service for the industry to gain more competitive advantage.

It is clear from the preceding discussion that a range of studies have been conducted on the competitiveness of South Africa's agricultural supply chains compared with other countries. However, none of these studies have compared the competitiveness of the South African deciduous fruit supply chains relative to those of the Chilean deciduous fruit supply chains. Du Toit (2000) only analysed the competitiveness of the South African apple industry compared to the competitiveness of the Chilean apple industry, with specific reference to the competition between these two countries on the European markets. A study that compares the supply chain competitiveness of all deciduous fruits relative to those of Chile is thus justified because such a study will enhance our knowledge of the ability of the South African deciduous fruit industry to compete with Chile.

2.8. Conclusion

The purpose of this chapter is to provide a literature review on agricultural supply chain analyses. The chapter presented a review of the literature on agricultural supply chain competitiveness analyses with an emphasis on the wide and diverse measures used in these studies. The chapter started with a definition of comparative advantage and competitiveness.

Supply chain interaction will be one of the important phenomena to affect the food and agricultural industries in the future. Van Rooyen *et al.* (2000) argue that value will be added or lost if the supply chain is not functioning in an effective and efficient manner, and this is the reason why it is necessary to analyse the competitiveness of the supply chain for the deciduous fruit industry. Worley (1996) states that in future supply chains will compete with one another, and if only certain parts of the supply chain are performing efficiently, the full potential for value adding will not be realised. An uncompetitive supply chain can, therefore, imperil the farm's level of profitability and vice versa.

CHAPTER THREE: A DESCRIPTIVE OVERVIEW OF THE SOUTH AFRICAN DECIDUOUS FRUIT INDUSTRY

3.0. Introduction

To understand the analysis that is central to this study, it is imperative to see where the South African deciduous fruit industry has come from and where it is going. The reader requires some knowledge of the growth of the industry over the past years to aid in an objective analysis and comparison of the industry's supply chain competitiveness.

The purpose of this chapter is, therefore, to give a descriptive overview of the domestic industry. First, the historical background of the industry is discussed. A discussion of South African and global deciduous fruit production, export and competitiveness trends then follows.

3.1. Historical background to the South African deciduous fruit industry

3.1.1. Origin of the industry

The production of fruit in South Africa has a long history dating back to the settlement of the Dutch at the Cape of Good Hope in 1652. According to Du Toit (1981), the deciduous fruit industry was born on Saturday, 24th of August 1652 when Jan Van Riebeeck noted in his diary: "planted some medlar and quince pips"; however, little is known about the first varieties planted (Nairn, 1977).

The commercialisation of the industry has its origins in the 18th century, and in 1892 the industry started producing on a large scale for export purposes. It started exporting in February 1892 when the well known 14 trays of dessert peaches were shipped to Great Britain (Du Toit, 1981). It was in 1910 when the industry began to export large volumes of fresh deciduous fruit to EU markets. This was possible due to the completion of the railway line through Michell's Pass, forming a direct railway link to Cape Town and making the exporting process very simple.

Exports came to a standstill with the outbreak of World War II in 1939 and only resumed when the war ended. According to Du Toit (1981), it was only after World War II that exports, especially to Great Britain, started their dramatic growth. The post-war years have been a period of progress on all fronts for the industry. More research was carried out and this led to the development of new and improved cultivars, more effective methods of pest and disease control, new irrigation techniques, and significant advances in production methods and management skills in the industry. These led to an increase in the production of deciduous fruit and hence an increase in exports to EU and UK markets. The window of opportunity that existed for south to north trade also led to an increase in exports, and this was the main reason for the development of an export industry.

This is how the South African deciduous fruit industry came to be and how it developed. From a humble beginning in the Western Cape in 1652, the industry developed into an internationally recognised business.

3.1.2. Changes in marketing systems

Historically, the South African agricultural sector has been heavily regulated, having been significantly influenced by the existence of many statutory boards. Like other agricultural industries, the deciduous fruit industry was regulated, and its marketing was controlled by a central body under the deciduous fruit scheme.

According to De Swardt (1983), the first controls over the marketing of agricultural products in South Africa were introduced in 1934 as a result of the recommendations of the Viljoen Committee. As a result, regulations were introduced in the deciduous fruit industry in an attempt to improve the profitability of farmers. This was followed in 1937 by the promulgation of the Marketing Act. Under this legislation, agricultural commodity producers could call for the introduction of a scheme to market their produce. The Deciduous Fruit Control Board was then formed to modernise and strengthen farming. The Board was given monopolistic powers over the distribution of deciduous fruit products (Broens *et al*. 2000). According to Keetch (2000), the Marketing Act of 1937 gave the Deciduous Fruit Board powers to fix prices and to regulate the overall marketing of deciduous fruits. The Board was also given statutory power to arrange all exports of deciduous fruit (Von Hoesselin, 1978).

Changes and adjustments to the marketing of deciduous fruit were made regularly, but the most significant changes and adjustments to marketing were the abolition of the Board and the deregulation of the industry. In 1992 the Kassier report on South African Marketing schemes emerged, calling for the abolition of all control boards and the deregulation of agriculture. These recommendations were supported by the African National Congress (ANC) and were eventually taken up in the new Marketing of Agricultural Products Act, No. 47 of 1996. This new Act represented a radical departure from the marketing regime to which farmers had become accustomed in the period since the 1930s.

In October 1997 the Deciduous Fruit Control Board was disbanded and the deciduous fruit industry started operating in an open market (Keetch, 2000). According to Darroch (2001), the new Marketing of Agricultural Products Act, No. 47 of 1996 provides a set of rules that differ greatly from earlier legislation and the former interventionist approach applicable to agribusiness.

The disbanding of the control boards and the deregulation of the industry brought advantages and many disadvantages and uncertainties. These include:

- The deregulation has increased the vulnerability of producers to external commercial risks and increased the competition between them to access the more profitable northern hemisphere markets. According to Barrientos *et al*. (2003) the process has affected some fruit producers and exporters in the industry negatively; others have been able to ride the crisis successfully; but some have been left struggling or have gone out of business. Phasing out control and marketing boards led to a short-term shortage of essential services formerly provided by the boards, such as storage, grading, deliveries, value adding, information dissemination, and research. The most important disadvantage of deregulation was that there was an entire collapse in information systems. To operate, the free market needs good information, and the industry still suffers from a lack of this due to the deregulation process.

- In the regulated market, quality standards were simple to maintain, as producers were required to export through a single channel. This feature has been lost in the deregulated market environment. According to Vink (2003) the first effect of

deregulation in the fruit export industries was the entry of hundreds of marketers, and hence a sharp decline in price and in quality delivered into a global market characterised by a rising demand for new products and a stagnant demand for conventional cultivars. Vink (2003) argues that the apple industry was hardest hit and experienced a decline in exports in the period immediately after deregulation in the mid to late 1990s. Nevertheless, total fruit exports increased in volume and value in the post-deregulation era.

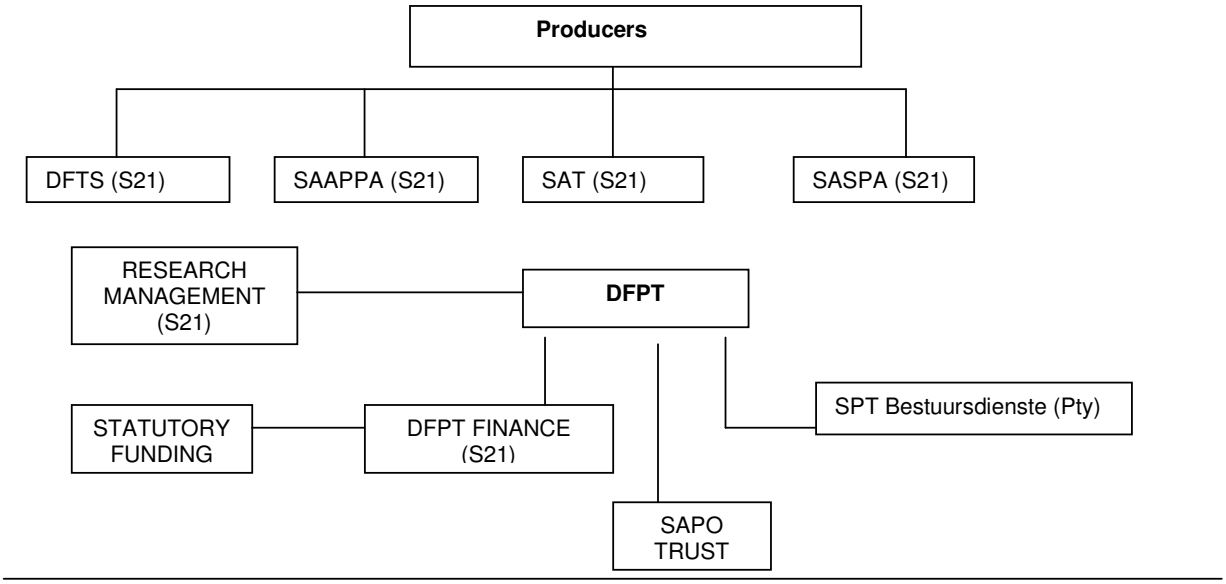
- According to De Vos (2003), prior to deregulation in 1997 there was a situation of single channel marketing for most deciduous fruits. This meant that the supply chain was relatively simple and easy to manage and optimise. This feature has been lost since deregulation of the fruit sector in October 1997.
- During the protected regulation years producers tended to specialise in, for example, one crop. After deregulation they were much more vulnerable due to overspecialisation.
- Van Rooyen *et al.* (2000) state that these changes require that producers and agribusinesses now have to position themselves as business-driven competitors in a less controlled global trading environment.

On the other hand, according to Darroch (2001), the deregulation of marketing of agricultural products in South Africa since 1996 has created a much wider range of marketing alternatives for a number of commodities. This means the deregulated market structure now in place allows freedom of choice. Producers are free to choose through whom to market their fruit; they can choose their own exporters and foreign market. Under the newly deregulated trading regime producers were more exposed to the shifting demand for new fruit types and varieties. While this had a negative impact on sales in the short-term, Vink (2003) argues that it has resulted in a new investment boom, as farmers have shifted replanting and new plantings to reflect this change in demand.

3.1.3 The new industry structure

After the deregulation process and the abolition of the Deciduous Fruit Board, the industry's structure changed and several new representative organisations were formed. The industry's new structure comprises producers, the different fruit associations, namely,

the South African Apple and Pear Producers' Association (SAAPPA), South African Table Grapes (SAT), the South African Stone Fruit Producers' Association (SASPA), DFPT Research Management (including technical transfer), Dried Fruit Technical Services (DFTS) and the Deciduous Fruit Producers' Trust (DFPT), which is the umbrella organisation of the industry. Figure 2 presents the structure of the representative bodies in the industry in the post-deregulation era.



Notes
DFPT – Deciduous Fruit Producers' Trust
DFTS – Dried Fruit Technical Services
SAAPPA – South African Apple and Pear Producers' Association
SAT – South African Table Grapes
SASPA – South African Stone Fruit Producers' Association
SAPO – South African Plant Improvement Organisation

Figure 2: Deciduous fruit industry structure

Source: DFPT (2005)

The Deciduous Fruit Producers' Trust (DFPT) is an umbrella body established to handle and co-ordinate all matters of common concern to role players in the industry. It was formed in 1997 by the three primary deciduous fruit producer associations, namely, SAAPPA, SAT and SASPA to protect their common interests. All members of the producer associations (those who have made their financial contributions) are beneficiaries of the

DFPT. The Trust aims to provide a cost-effective communal system that will interact with farmers to provide necessary activities such as research and development, plant improvements, certification, domestic generic promotions and general information distribution. Its priority is to collect information regarding developments, trade and market access opportunities, phytosanitary protection, production levels, and industry figures, statistics and norms. It acts as the mouthpiece of the industry and communicates with government authorities and other interest groups (DFPT, 2005).

The DFPT represents South African fresh deciduous fruit producers to ensure a global competitive edge, and it aims to promote growth and prosperity for the wider deciduous fruit community. It is actively working to promote South African produce overseas as well as in local markets. In this regard, it manages and coordinates various special export programs on behalf of the industry.

Dried Fruit Technical Services (DFTS) is a Section 21 (non-profit) company. The DFTS had its origin in 1996 with the alteration, or modification, of the control boards in agriculture by the Marketing Act to phase out and end the single channel system. It is industry driven but independent and in a good position to adhere to the specific needs of the participants involved. The statutory responsibility and supervision of the DFTS's current assets is carried forward to the DFPT. It focuses on the research and development needs of all dried fruit producers. All importers, packers, exporters and processors of dried fruit register with DFTS. Each importer, packer, exporter and processor of dried fruit furnishes accurate returns to DFTS in respect of dried fruit handled, imported or exported.

The South African Apple and Pear Producers' Association (SAAPPA) was established in the early 1970s to promote and protect the interests of the apple growers and later also those of the pear growers of South Africa. The Association is a Section 21 (non-profit) company representing the eight main pome fruit production regions in South Africa. SAAPPA falls under the structure of the DFPT, the umbrella industry service organisation to which SAAPPA nominates trustees. It is also a shareholder of DFPT research, the entity that directs and guides the industry's research needs and expenditure. The main functions of SAAPPA are to rationalise and promote the production and marketing of apples and pears (and apple and pear products); to encourage and pursue constructive dialogue and

mutual co-operation with government and other parties in order to promote the interests of the Association and its members; to foster mutual trust and long-term relationships among role players and stakeholders; to establish a reciprocal information system; to promote the maintenance of responsible and sustainable production and marketing practices; and to support and assist the development of its decision-making systems and structures. It facilitates, among other functions, research, communication, trade and market access, transformation and training, Black Economic Empowerment (BEE), land reform, social development projects, plant improvement, plant certification and cost surveys (DFPT, 2005).

South African Table Grapes (SAT) is a Section 21 (non-profit) company representing all South African table grape producers and is funded entirely by its producers. The Association is taking proactive steps to optimise the logistic services along the supply chain to ensure that grapes reach consumers in the same crisp condition as when picked. It has fostered good partnerships with export companies, who display their individual brands. It is also committed to raising the level of awareness of excellent fruit quality in world markets.

SASPA is a Section 21 (non-profit) company representing all South African stone fruit producers. In August 1990, the Plum Producers' Association and the Nectarine and Peach Producers' Association dissolved and founded the South African Stone fruit Producers' Association (SASPA). Following the changes initiated by the new Agricultural Marketing Act of 1996, SASPA converted to a Section 21 (non-profit) company in 1997. SASPA falls under the structure of the DFPT and the Association nominates trustees. SASPA is also a shareholder of DFPT Research Management. The main functions of SASPA are to promote the common interests and specific needs of stone fruit producers in South Africa and to act as their official mouthpiece and representative; to rationalise and promote the production and marketing of stone fruits (and stone fruit products); to encourage and pursue constructive dialogue and mutual co-operation with government and other parties; to foster mutual trust and long-term relationships among role players and stakeholders; and to establish and promote a reciprocal information system to arm the industry with all available information to enable stakeholders to make informed market decisions. The Association is committed to engage in orderly, responsible and viable production practices which are sustainable over the long term, to stimulate and encourage new product

development and product variety, and to strengthen adherence to the disciplines and standards that ensure quality, food safety and environmental protection. Other initiatives that SASPA facilitates are research, communication, trade and market access, transformation and training, Black Economic Empowerment (BEE), land reform, social development projects, market information, plant improvement, plant certification and cost surveys (DFPT, 2005).

DFPT Research Management is a Section 21 (non-profit) company put in place by the Deciduous Fruit Producers' Trust. Research is commissioned by the producer associations to DFPT Research via DFPT. DFPT Research manages the research process for the fresh fruit deciduous fruit industry. The main purposes of the research unit are to direct and guide research to address the short- and long-term needs of the industry; to institute effective and efficient management systems; to access and develop new funding sources, to facilitate the development of people to create the required capacity to meet the needs of the industry now and in the future; and to institute an effective system of transferring information and results of research back to the growers and other funders of research in order to develop new facts that will improve the growers ability to compete in world markets and to discover and develop new technologies that will make South African growers world leaders in specific fields.

DFPT Finance receives and administers all the financial contributions from producers in terms of approved budgets according to the fruit kind and function.

SAPO Trust is a specialist plant improvement organisation owned by deciduous fruit growers through the DFPT, the Canning Fruit Growers' Association (CFGA) and the Dried Fruit Technical Services (DFTS). It is responsible for production of certifiable propagation plant material. It is also responsible for phytosanitary and genetic upgrading (improvement) of deciduous fruit plant material. This includes virus elimination and testing; establishment and maintenance of nucleus, foundation and mother blocks; as well as the selection of propagation plant material and trueness to variety controls. The Trust draws up and manages the plant improvement budget. The main objective of the Trust is to supply the best quality plant material, measured against certification standards, at a high speed to the industry. This also includes the sourcing, development and commercialisation

of new varieties needed in the industry or even in niche markets by entrepreneurs (DFPT, 2005).

3.2 Supply chain structure of the South African deciduous fruit industry

Figure 3 illustrates the simplified supply chain sequence for fresh deciduous fruit. This shows that the supply chain comprises commercial entities. The primary activities include breeding, plant development, nursery operations and orchard cultivation and maintenance. It encompasses all the production preparations by the producer that ensure optimum yields without compromising quality. Good primary activities are crucial for sustainable production and are also important where issues of traceability, environmental concerns and quality assurance are involved.

The logistics processes include packing and all other activities, such as cooling, until the fruit reaches the ultimate consumer. The fresh fruit supply chain, from farm to fork, will never be able to eliminate the need for cold storage facilities. This is because deciduous fruits are highly susceptible to damage and sensitive to temperature fluctuation. They, therefore, require cooling facilities. Cooling is one of the critical elements of the fresh deciduous fruit supply chain.

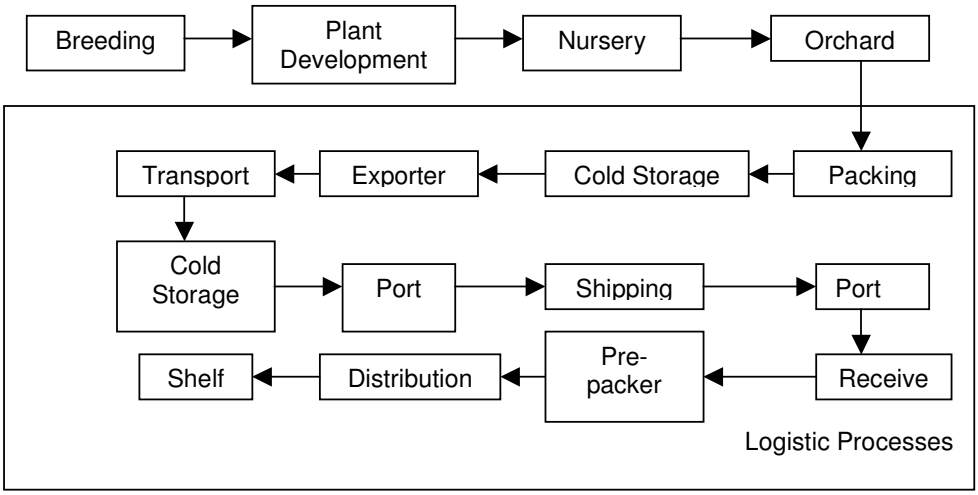


Figure 3: The deciduous fruit export supply chain

Source: Rabe, 2003.

3.3 The South African deciduous fruit industry's contribution to the economy

The deciduous fruit industry is an important part of the South African economy because of its contribution to domestic consumption and employment. The industry is highly significant to the economies of both South Africa and the Western Cape province, the heart of the deciduous fruit industry. It is an export-driven industry, exporting most of its fruit to international markets and, in the process, earning more than R4.6 billion per annum (Fruit Industry Plan, 2004). The foreign exchange earned by the industry's exports is important to South Africa as a developing country.

The industry is labour intensive and it provides employment opportunities for disadvantaged communities, particularly Africans and Coloureds. Table 2 shows direct employment in the industry. An industry survey conducted recently in the most prominent deciduous fruit production regions revealed that there are 99,778 farm workers employed in the industry with 399,110 dependants who are directly dependent on them. The grape sub-sector employs 33,435 workers, while the pome and stone fruit industries employ 43,461 and 22,882 workers respectively. Most of these workers are women who are increasingly employed as a 'reserve army' of part-time workers to do contract and informal work picking and packing fruit for export.

Although there is potential for the industry to make a contribution to the pressing problem of rural unemployment and rural development, since most of the workers are in rural areas, employment has been decreasing since 2003. According to Table 2 total employment has decreased by 4.7 percent from 104,440 workers in 2003 to 99,778 workers in 2005. The reduction in employment could be because of the strengthening of the South African rand which makes the producers price drop, resulting in export farming income dropping. The deciduous fruit industry is export driven; therefore the strengthening of the rand and the reduction in export income affects employment negatively.

Table 2: Employment of workers and dependents on deciduous fruit farms

	2003		2004		2005	
Fruit Type	**Workers**	**Dependents**	**Workers**	**Dependants**	**Workers**	**Dependants**
Apples	28,068	112,272	26,747	106,988	28,540	114,158
Pears	16,140	64,558	15,322	61,288	14,921	59,684
Grapes	35,093	140,371	36,014	144,054	33,435	133,741
Plums	6,699	26,796	6,444	25,775	5,443	21,770
Peaches	11,490	45,959	11,355	45,418	10,872	43,489
Nectarines	1,724	6,896	1,772	7,088	1,822	7,287
Apricots	5,226	20,904	5,000	20,001	4,745	18,981
Total	**104,440**	**417,756**	**102,653**	**410,611**	**99,778**	**399,110**

Source: OABS, 2005

3.4 Local and global production of deciduous fruit

In this section both local and global deciduous fruit production is discussed. South Africa is compared with its global competitors in terms of its deciduous fruit production share and performance.

3.4.1. South African deciduous fruit production

(a). Area planted

South Africa's climatic conditions are ideally suited to the production of deciduous fruit. The country's supply of deciduous fruit is year-round, providing a large selection of produce. The industry offers a comprehensive fruit basket of most fruit types, varieties, colours, tastes and sizes. According to Fruit Industry Plan (2004) there are 11 varieties of apples, 9 varieties of pears, 12 varieties of grapes, 12 varieties of plums, 13 varieties of peaches and 13 varieties of nectarines produced by the industry.

A wide range of deciduous fruit is grown in a number of geographically diverse areas. The production is broadly split into two sub-areas. These include the winter rainfall areas comprising mainly the Western and Southern Cape provinces and the summer rainfall area comprising the Northern Cape, Limpopo and Free State provinces. The Western

Cape area (the heart of the deciduous fruit industry) produces by far the greatest amount of deciduous fruit. Other production areas include Mpumalanga and Gauteng provinces.

According to DFPT (2005), approximately 74,246 hectares (ha) of deciduous fruits are currently planted in South Africa. Figure 4 shows the area in hectares in South Africa planted with different deciduous fruits. According to the Figure, the total area planted with grapes is approximately 22,755 ha, with the Western Cape province comprising the largest area. Figure 4 indicates further the sharp increase in total area planted to grapes from 2001 until 2005. The total area planted to apples is 20,774 ha, with the Western Cape province again comprising the largest area. From Figure 4 it is clear that the total area planted to apples decreased by 10 percent from 22,952 ha to 20,774 ha between 2001 and 2005.

The winter rainfall area, particularly that of the Western Cape, has the largest area planted to various deciduous fruits. Pear production is mostly concentrated in the Western Cape with little production in other provinces. The total area planted with pears is 11,812 ha. From Figure 4 it is clear that the total area planted with pears decreased by 14 percent from 13,455 ha to 11,812 ha between 2001 and 2005. The total area planted with apricots is 4,302 ha, the total area planted with plums is 4,111 ha, the total area planted with nectarines is 1,457 ha, and the total area planted with peaches is 9,035 ha, with the Western Cape province comprising the largest area planted to all of these products. Figure 4 shows that the total area planted with apricots, plums, nectarines and peaches has been fluctuating from 2001 to 2005. From Figure 4 one can conclude that there has been a decrease of total area planted with all the different deciduous fruits, except for grapes which show an increase in total area planted.

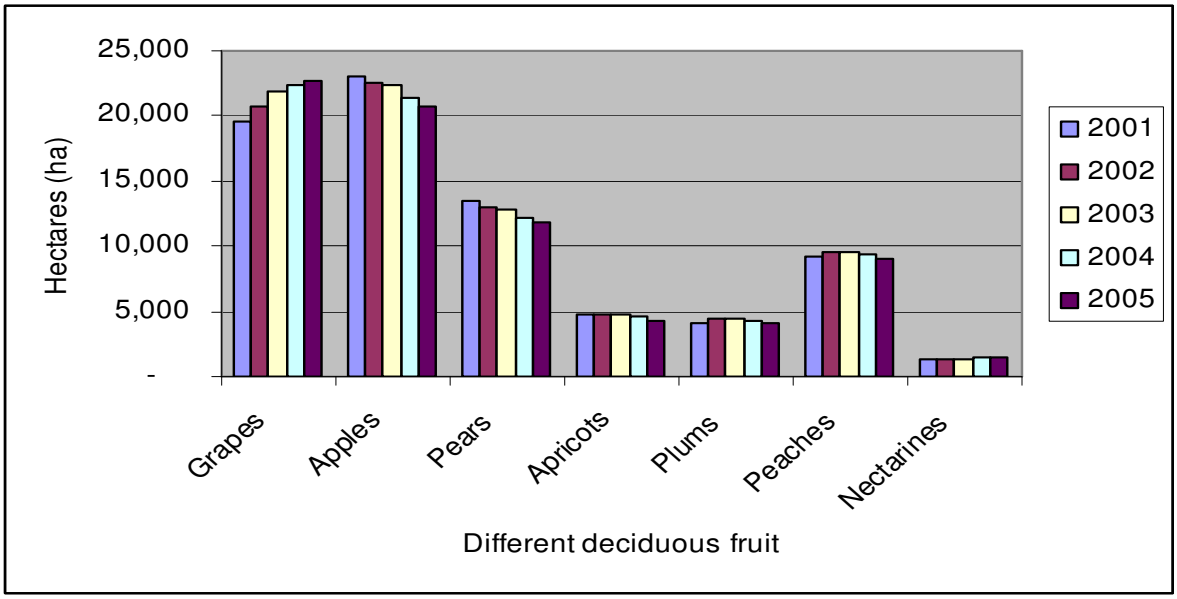


Figure 4: Area planted to different deciduous fruits in South Africa

Source: DFPT, 2005

(b) Production

In 2004 South Africa produced approximately 2 percent of the world's pears and less than 1 percent of the world's plums (FAO, 2005). Table 3 shows the production of different deciduous fruits in South Africa. From Table 3 it is clear that total grape production increased from the 1993/1994 to the 2002/2003 seasons. However, the volumes fluctuated greatly from year to year. Production reached a peak during the 2003/2004 season with most (158,064 tons) of the grapes used for raisins.

Table 3 indicates further the sharp increase in total production of apples from the 1995/96 and 1996/97 seasons to the 2001/2002 and 2002/2003 seasons. The sharp increase in total production of apples was supported by a devaluation of rand during the period 1998 to 2002, which resulted in export growth, increased farming income and increased investments in agriculture. During this period agricultural export markets opened up, encouraging producers to produce more deciduous fruits for exports. However, total production declined during the 1997/1998 and 1998/1999 seasons by 11 percent from 696,727 to 628,619 tons. The reason for the decline was deregulation which took place in 1997. According to Vink (2003), the apple industry was hardly affected by the deregulation process. The 2002/2003 season showed a 13 percent increase in total apple production

compared with the previous season. Apricots and plums experienced a constant production trend from the 1991/92 to the 2002/2003 seasons. Peach and nectarine production increased by 31 percent from 1993/94 to 1996/97, declined by 11 percent from 1996/97 to 1997/98, and again increased by 8 percent from 1997/98 to 1998/99. The decline in peach and nectarine production during the 1996/1997 and 1997/1998 seasons could be because of the closing down of the marketing and control boards which took place in October 1997. Peach and nectarine production decreased sharply in 1999/2000 and 2000/2001 from 205,986 to 148,113 tons, but increased again in 2001/2002 to 2002/2003. The total production of pears, on the other hand, showed a sharp increase during the 2000/2001 season and 2001/2002 season. The aggregate situation is that the deciduous fruit industry showed a positive growth in terms of total production. However, the 2004/2005 season was a bad season for the deciduous fruit industry. From Table 3 it is clear that the total production for nearly all deciduous fruit types decreased, except for peaches and nectarines. The reason for the decline could be that the rand continues to strengthen. The industry is export driven and the strengthening of the rand affects the sustainable production of most of the producers. It is also expected that a strong rand will reduce the number of fruit farmers in the supply chain.

Table 3: Production of different deciduous fruits in South Africa (1000 tons)

Year (Oct-Sept)	Grapes	Apples	Pears	Apricots	Plums	Peaches & nectarines
1991/92	275.033	559.077	212.901	54.938	18.151	160.197
1992/93	207.74	599.316	247.460	55.121	18.583	158.217
1993/94	255.358	632.835	222.589	52.791	27.862	149.963
1994/95	280.576	640.893	231.414	60.177	29.417	183.983
1995/96	245.554	578.711	233.305	65.045	33.640	184.871
1996/97	298.821	704.157	293.864	66.006	36.317	217.696
1997/98	289.397	696.727	261.316	60.605	37.011	195.901
1998/99	379.220	628.619	275.032	66.889	47.282	213.961
1999/2000	351.452	692.181	287.554	50.661	32.832	205.986
2000/2001	342.832	673.848	263.891	63.679	39.821	173.868
2001/2002	393.484	626.107	337.311	56.509	37.999	189.647
2002/2003	386.787	701.663	303.459	50.069	58.336	249.290
2003/2004	427.491	756.144	342.835	97.774	62.843	178.203
2004/2005	351.483	658.940	328.631	43.261	55.278	184.783

Source: OABS, 2005

3.4.2. Global deciduous fruit production

Table 4 shows the total global production of different deciduous fruit products. From Table 4 it is clear that global grape production increased from 56,060,657 to 66,569,761 tons between 1991 and 2003. Figure 5 shows the major grape producing countries and their contributions to total global production. According to this figure the major grape producing countries and their contributions to total global production are China and Argentina, each contributing an average of 4 percent; Chile, contributing an average of 3 percent; France, contributing an average of 12 percent; Italy, contributing an average of 15 percent; Spain, contributing an average of 9 percent; USA, contributing an average of 10 percent; and South Africa only contributing an average of 3 percent.

Table 4: Global production of different deciduous fruits in million metric tons

Year	Grapes[2]	Apples	Pears	Apricots	Plums	Peaches & nectarines
1995	55.971795	50.324145	12.791337	2.098003	6.496068	10.896505
1996	59.089709	56.276743	13.816479	2.585453	8.210827	11.701868
1997	58.423391	57.447319	14.289994	2.396175	8.113349	11.366892
1998	57.032866	56.789129	15.225358	2.50278	7.657987	11.442666
1999	60.89848	58.100252	15.73831	2.52686	8.534102	13.211947
2000	64.813052	59.265547	16.83502	2.774896	9.043784	13.349775
2001	60.780149	57.820063	16.660953	2.521465	9.105005	14.01824
2002	62.012987	55.598981	17.39144	2.47926	8.997294	14.754175
2003	62.793596	58.740234	17.757171	2.753082	10.370909	14.862162
2004	66.569761	61.919066	18.097558	2.642222	9.521336	15.408553

Source: FAO, 2005

[2] Grapes in the FAO production statistics include all grapes, including wine and table grapes.

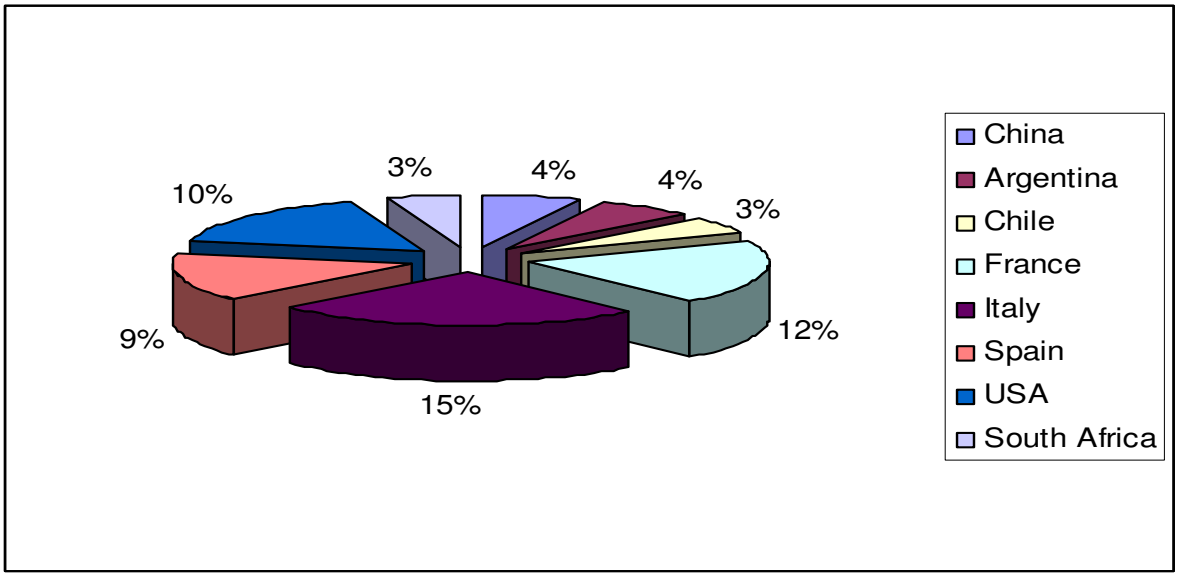


Figure 5: The major contributors to total global grape production

Source: FAO, 2005

The total world apple and pear production increased substantially from 1991 to 2004. However, as Table 4 also shows, world apple production decreased in 2000, after which an increase was experienced in 2002 to 2004. Figure 6 shows the major pear producing countries and their contributions to total global pear production. According to Figure 6, South Africa contributes approximately 2 percent of the world's total pear production. Major pear producing countries and their contributions to world production are China, with an average of 48 percent; the USA and Italy, each with 6 percent; Spain, with 4 percent; and Argentina, Germany and Japan, each with 3 percent.

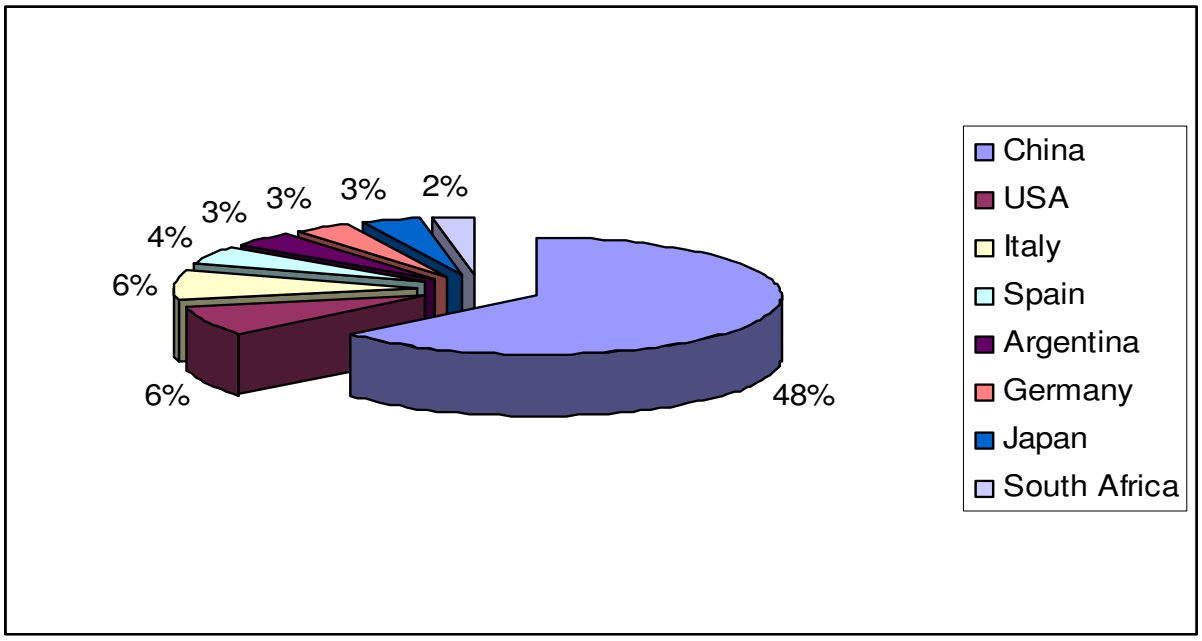


Figure 6: Major contributors to total global pear production

Source: FAO, 2005

Total world plum production, on the other hand, has been fluctuating from 1991 to 2004, as Table 4 shows. However, there has been a slight increase in the world total plum production between 1991 and 2004. Figure 7 shows the major plum producing countries and their contributions to total global plum production. According to this Figure South Africa produces 1 percent of the world's total plum production. The major plum-producing countries and their contributions to total world production are China, with 44 percent; the USA, with 10 percent; Romania, with 6 percent; Germany, Serbia and Montenegro, each with 5 percent.

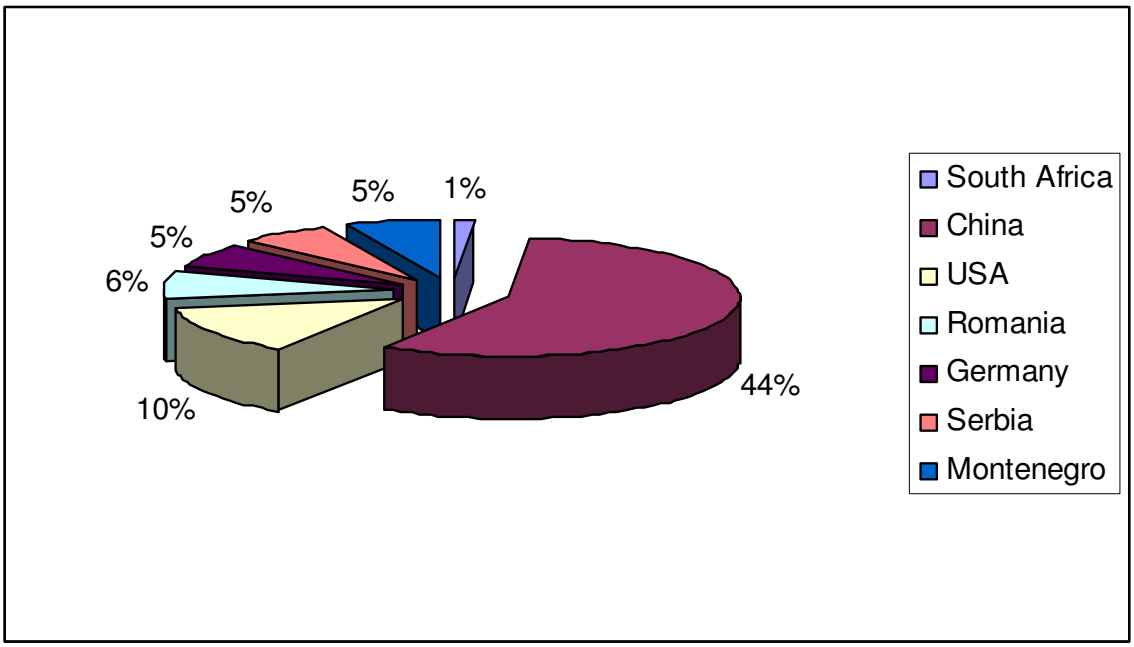


Figure 7: Major contributors to total global plum production

Source: FAO, 2005

From Table 4 it is also clear that from 1991 to 2004 total world peach and nectarine production experienced a rising trend, whereas total world apricot production experienced a constant trend. Figure 8 shows the major peach and nectarine producing countries and their contributions to total global peach and nectarine production. According to Figure 8, the major peach and nectarine producing countries and their contributions to total global production are China, contributing an average of 27 percent; Italy, contributing 13 percent; the USA, contributing 11 percent; Spain, contributing 8 percent; Greece, contributing 7 percent; and France, contributing 4 percent.

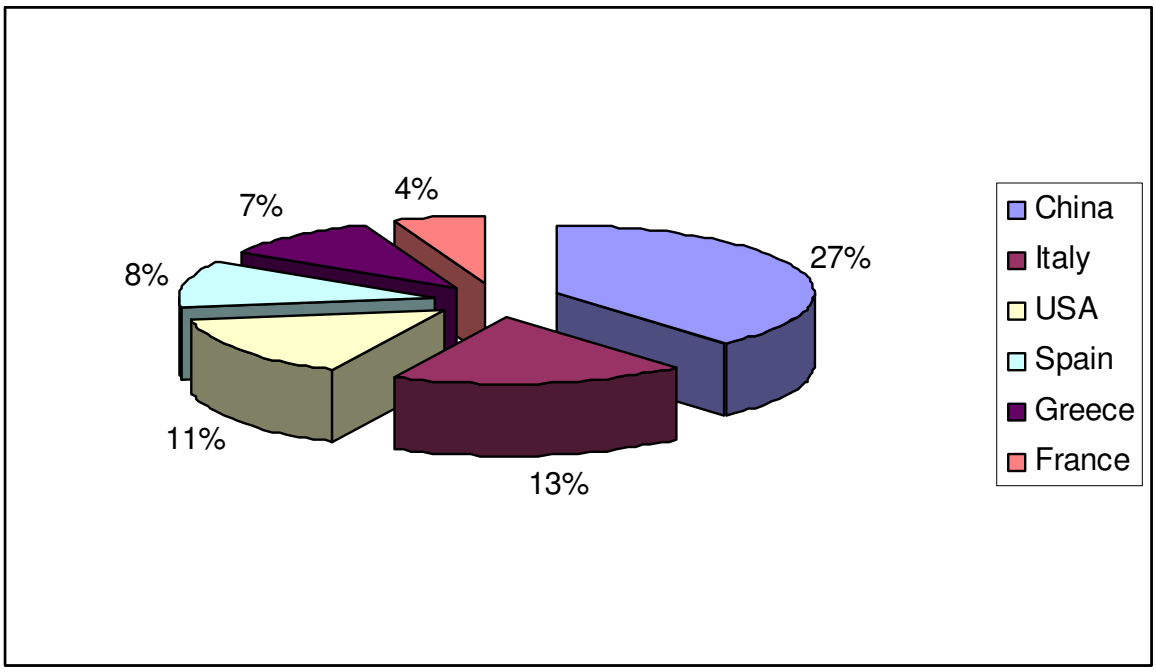


Figure 8: Major contributors to total global peach and nectarine production

Source: FAO, 2005

3.5 South African deciduous fruit export trends

In this section the total amount of different deciduous fruit products traded globally is discussed. The deciduous fruit industry is still one of the largest export industries in South Africa, exporting approximately 738,616 metric tonnes of the total deciduous fruit production. The industry's exports are quality driven, and it is successfully adjusting to a diverse set of international market demands. The EU and UK remain by far the largest importers of South African deciduous fruit, with smaller volumes finding their way to the Middle East, Asia, the USA and the Far East. This forms part of the following discussion.

Figure 9 shows South Africa's total exports of different deciduous fruits from 1991 to 2003. From Figure 9 it is clear that grape exports increased substantially from 1991 to 2003. However, as Figure 9 also shows, grape exports decreased from 2002 to 2003. Growth in exports during the 1990s was partly the result of the devaluation of the rand and successful political transition that contributed to a relatively easy transition to a more open economy. Grape exports decreased during 2002 and 2003 as a result of the strengthening of rand during these periods.

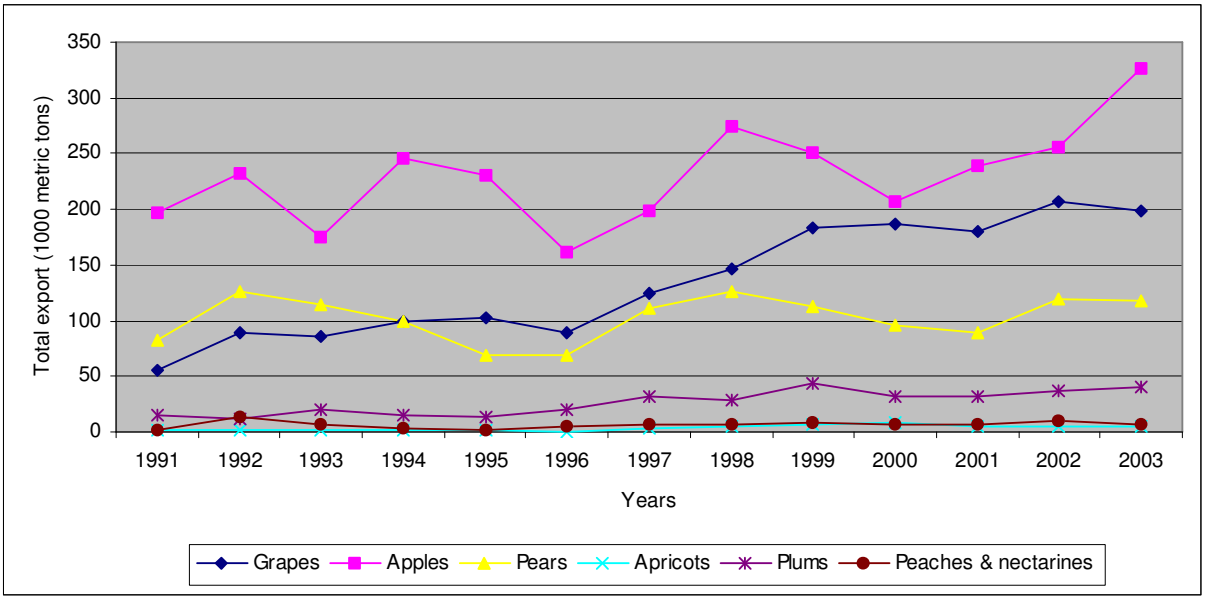


Figure 9: South African exports of different deciduous fruits in metric tons

Source: FAO, 2005

Figure 10 shows South African grape exports per market destination. From Figure10 it is clear that an average of 85 percent of South African grapes is being exported, with Northern Europe (62%), the UK (24%), the Middle East (3%) and the Far East (3%) being the major destinations. The remaining percentage is exported to Southern Europe, USA and Canada, Russia and African countries.

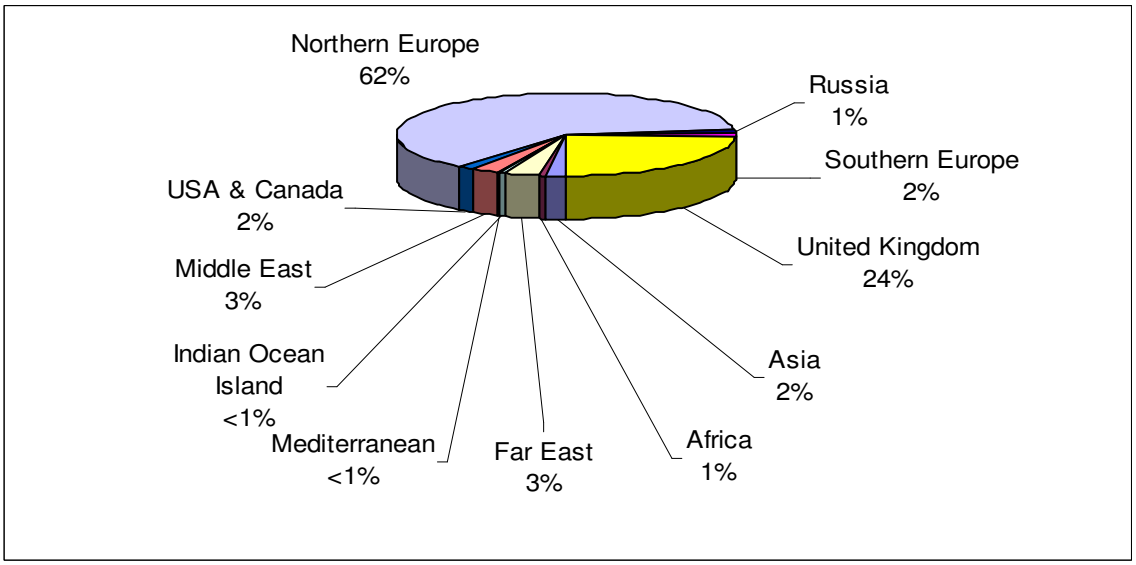


Figure 10: South African grape exports per market destination

Source: PPECB, 2005

Annual export volumes of apples have varied year to year. Figure 9 shows that exports of apples have been fluctuating from 1991 to 2003. Figure 9 indicates further the sharp decrease in total apple exports from 1998 and 2000. This was partly the result of the deregulation which took place in late 1997. According to Vink (2003), the apple industry was hardest hit by the deregulation and experienced a decline in exports in the period immediately after deregulation in the mid to late 1990s. However, there has been a substantial increase in apple exports between 2000 and 2003.

Figure 11 shows South African apple exports per market destination. South Africa contributes only 4 percent of the world's total apple exports, with its major export destinations being the UK (42%), Northern Europe (22%), Asia (9%), Western Africa (7%), the Middle East (5%) and the Far East (5%).

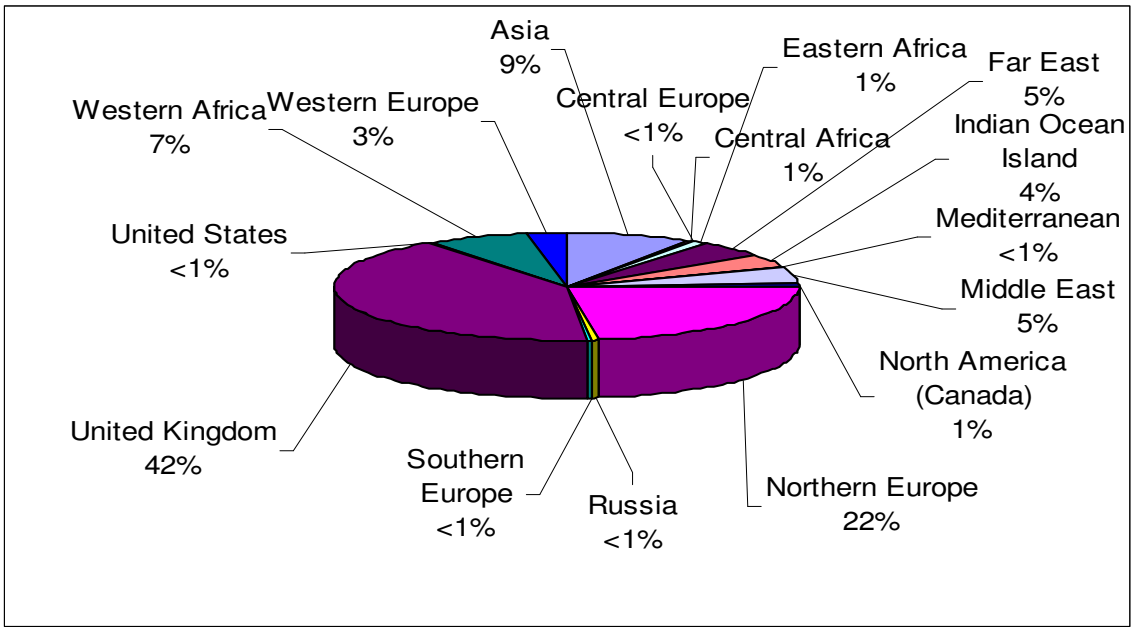


Figure 11: South African apple exports per market destination

Source: PPECB, 2005

From Figure 9 it is clear that pear exports have experienced a rising trend, except from 1992 to 1996, when exports decreased substantially. According to Fruit Industry Plan (2004) this was due to the drought that occurred during this time.

Figure 12 shows South African pear exports per market destination. South Africa exports an average of 40 percent of its pears, with Europe (58%) being the biggest market destination, followed by the UK (22%), the Far East (4%) and Asia (4%). The Middle East, Mediterranean, Canada and USA, Russia, and Africa import 2% each. Domestic pear exports account for approximately 6 percent of total global exports.

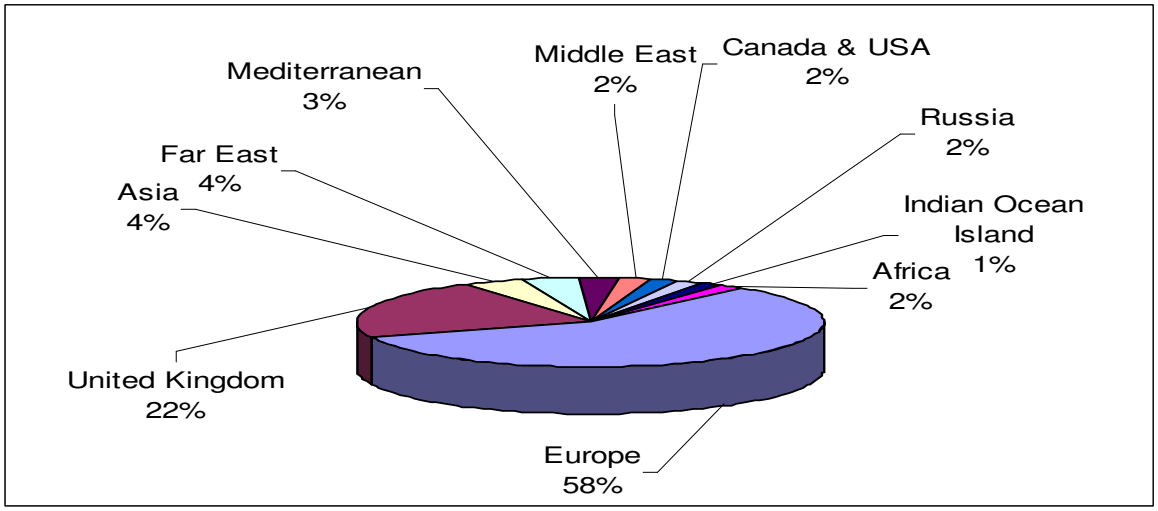


Figure 12: South African pear exports per market destination

Source: PPECB, 2005

Local apricot and plum exports, on the other hand, contribute 3 percent and 8 percent to total world exports respectively. From Figure 9 it is clear that exports of both apricots and plums have being increasing from 1991 until 2003. Figure 13 shows South African apricot exports per market destination. An average of 5 percent of total apricot production is being exported, with Northern Europe (57%) being the biggest market destination, followed by the UK (32%), the Middle East (9%), the Far East (1%) and Southern Europe (1%).

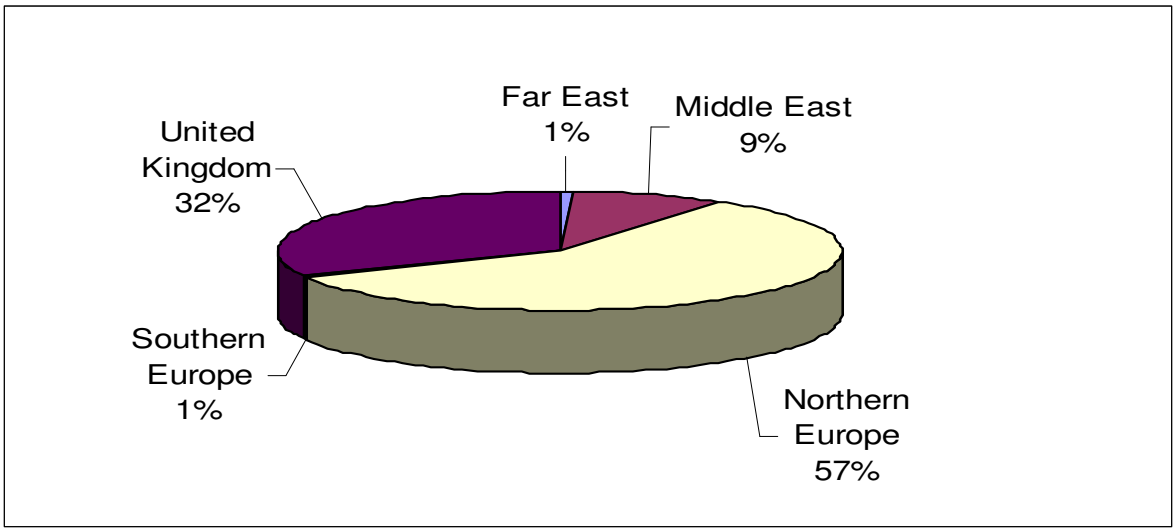


Figure 13: South African apricot exports per market destination

Source: PPECB, 2005

Figure 14 shows South African plum exports per market destination. An average of 78 percent of total plum production is being exported, with Northern Europe (51%) being the biggest market destination, followed by the UK (31%), the Middle East (7%) and Southern Europe (5%).

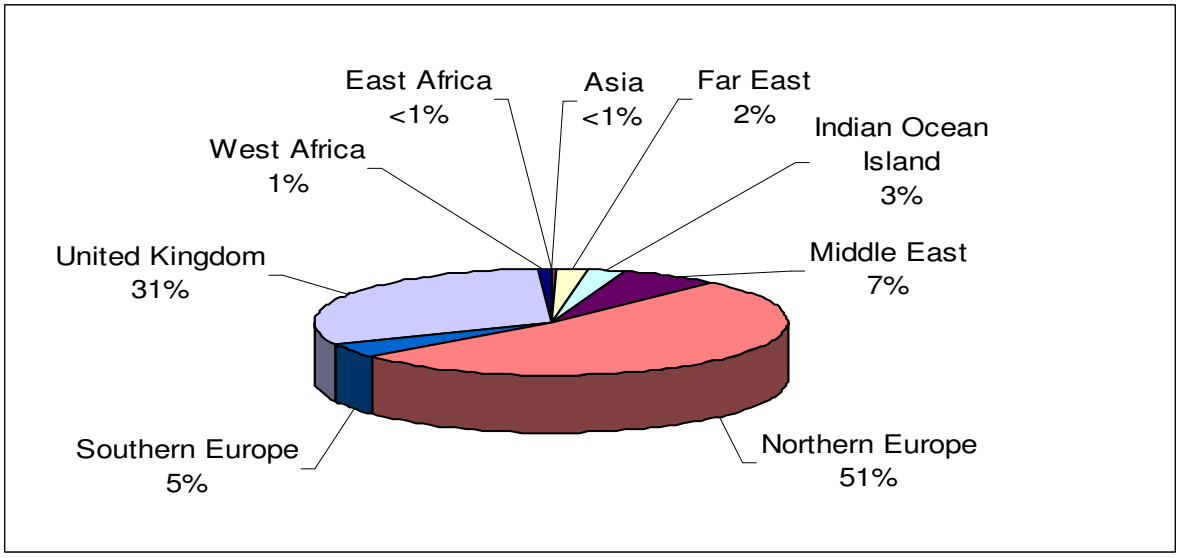


Figure 14: South African plum exports per market destination

Source: PPECB, 2005

Local peach and nectarine exports, on the other hand, have been increasing from 1991 to 2004. Figure 9 shows that exports of both peaches and nectarines increased from 1995 to 2003. An average of 2 percent of the South African peach, and approximately 80 percent of the nectarine crop are exported, with the UK being the biggest market destination. The export per market destination for both peaches and nectarines can be seen in Figures 15 and 16 below.

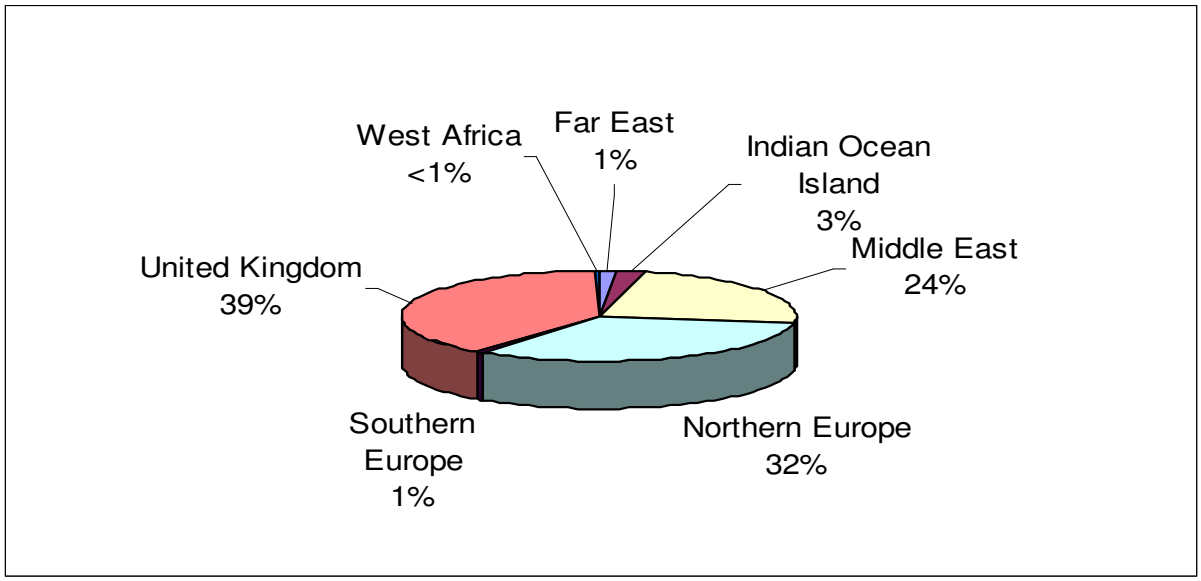


Figure 15: South African peach exports per market destination

Source: PPECB, 2005

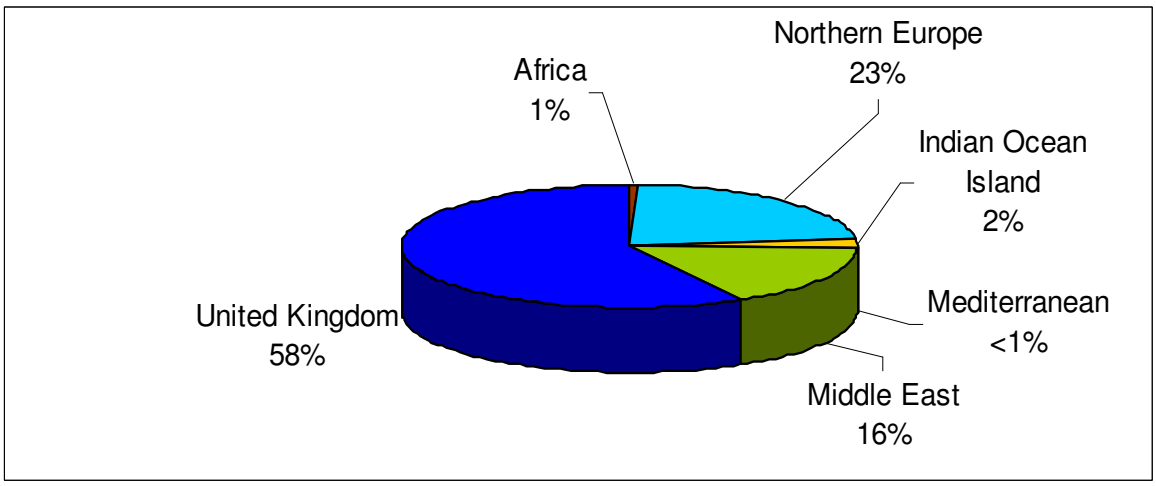


Figure 16: South African nectarine exports per market destination

Source: PPECB, 2005

3.6 The South African deciduous fruit competitive trend

Competitiveness was calculated taking into consideration production efficiency; industry infrastructure and inputs; and financial and market factors. Production efficiency includes the percentage change in production from 1997-99 to 2002-04; relative variability of production from 1994 to 2004; percentage of non-bearing acreage in 2004; percentage of production of newer varieties in 2004, planting density in 2004 (trees per hectare); and average yield per hectare (in metric tons) from 2002 to 2004. Industry infrastructure and inputs include adequacy of storage, modern packaging facilities, marketing systems, land availability, water availability, labour availability, and input costs. The financial and market factors include interest rates in 2004, inflation rates in 2004, capital availability, security of property rights, product quality control, percentage of production exported from 2002 to 2004, an average export price in 2003 (US$ per metric ton), and an average distance to market (kilometres).

3.6.1 Apple competitiveness

The South African apple industry ranks 11th out of 28 apple producing countries in terms of competitiveness, as can be seen in Table 5. It ranks 4th in terms of production efficiency, 10th in terms of infrastructure and inputs, and 17th in terms of financial and market issues. Poor performance on financial and market issues occurred because of the strong rand compared with the devaluated currencies of our main competitors, such as that of Chile. The strong rand will in the short run remain to put pressure on South Africa's competitive ability.

Table 5: South Africa's competitiveness in apple production

RANK	OVERALL	PRODUCTION EFFICIENCY	INFRASTRUCTURE & INPUTS	FINANCIAL & MARKETS
1	***Chile***	Netherlands	***Chile***	France
2	New Zealand	***Chile***	United States	Italy
3	France	New Zealand	New Zealand	Belgium
4	Italy	***South Africa***	Argentina	***Chile***
5	Netherlands	Australia	France	New Zealand
6	Australia	Belgium	Canada	Japan
7	Belgium	France	Italy	Australia
8	United States	Brazil	Brazil	Netherlands
9	Japan	Germany	Turkey	United Kingdom
10	Germany	Italy	***South Africa***	Germany
11	***South Africa***	Poland	Japan	United States
12	Canada	Japan	Austria	Canada
13	Australia	Australia	Germany	Spain
14	Argentina	Argentina	Belgium	Australia
15	Spain	Hungary	Netherlands	Greece
16	United Kingdom	United States	Australia	Portugal
17	Brazil	Turkey	United Kingdom	***South Africa***
18	Turkey	Russian Fed.	Spain	Argentina
19	Poland	China	China	Mexico
20	Portugal	Canada	Greece	Poland
21	Greece	Portugal	Mexico	China
22	China	Spain	Portugal	Bulgaria
23	Hungary	Serbia Montenegro	Poland	Hungary
24	Mexico	Mexico	Hungary	Serbia Montenegro
25	Serbia Montenegro	Romania	Serbia Montenegro	Turkey
26	Russian Fed.	Greece	Bulgaria	Brazil
27	Bulgaria	United Kingdom	Russian Fed.	Russian Fed.
28	Romania	Bulgaria	Romania	Romania

Source: O' Rourke (2005)

3.6.2 Pear competitiveness

The competitiveness of South Africa's pears overall ranks 7th out of the 18 major pear producing countries, as can be seen in Table 6. It ranks first in terms of production

efficiency, 8th in terms of infrastructure and inputs and 16th in terms of financial and market issues.

Table 6: South Africa's competitiveness in the pear market

RANK	OVEARALL	PRODUCTION EFFICIENCY	INFRASTRUCTURE & INPUTS	FINANCIAL & MARKETS
1	United States	***South Africa***	***Chile***	Belgium
2	***Chile***	Austria	United States	Italy
3	Australia	Netherlands	New Zealand	Netherlands
4	Netherlands	Germany	Argentina	Australia
5	Italy	Argentina	France	United Kingdom
6	New Zealand	Belgium	Canada	***Chile***
7	**South Africa**	Russian Fed.	Italy	France
8	Belgium	United States	***South Africa***	Germany
9	Germany	Australia	Germany	New Zealand
10	Argentina	Italy	Australia	Spain
11	France	Spain	Netherlands	Canada
12	Canada	New Zealand	Belgium	United States
13	Australia	France	Australia	Australia
14	United Kingdom	United Kingdom	United Kingdom	Greece
15	Spain	Canada	Spain	Argentina
16	Greece	***Chile***	Mexico	***South Africa***
17	Greece	Greece	Greece	Mexico
18	Russian Fed.	Mexico	Russian Fed.	Russian Fed.

Source: OABS, 2005

3.7 Conclusion

The purpose of this chapter was to give a descriptive overview of the South African deciduous fruit industry. The chapter provides an overview of the industry, with a special emphasis on historical background, supply chain structure, contribution of the industry to the economy, global and local production trends and competitiveness.

As discussed in this chapter, grapes are the most abundantly produced deciduous fruit in the world, whereas apples are the main deciduous fruit produced in South Africa. The deciduous fruit industry competes successfully in global markets. The apple industry's overall competitiveness ranks 11th and the pear industry ranks 7th in the world.

The next chapter (Chapter Four) provides a descriptive overview of the Chilean deciduous fruit industry.

CHAPTER FOUR: A DESCRIPTIVE OVERVIEW OF THE CHILEAN DECIDUOUS FRUIT INDUSTRY

4.0. Introduction

In comparing the South African deciduous fruit supply chain's competitiveness with that of Chile, it is important to know about the Chilean deciduous fruit industry's performance. The reader requires some knowledge of the Chilean deciduous fruit industry to aid an objective analysis and comparison of the South African and Chilean deciduous fruit supply chains' competitiveness. The purpose of this chapter is, therefore, to give a descriptive overview of the Chilean deciduous fruit industry. First, the production trend is discussed; a discussion of export and competitiveness trends follows; and the chapter concludes by looking at the success factors of the Chilean deciduous fruit industry.

4.1. Background to the Chilean deciduous fruit industry

Chile is a small country in South America with a small economy, endowed with very limited resources. Stretching north to south for 2,880, miles, the country extends through several climatic zones, from hot and desert conditions in the north to cold Antarctic influences in the south. Its geographical barriers help protect its agricultural sector from diseases. With a climate, landscape and soil conditions conducive to agricultural production, Chile is home to an active and dynamic agricultural sector. The country is safely sheltered by its desert, ocean, mountain and ice field borders, which form natural barriers to insects and diseases. According to Shearer (2004) the country's wide range of climates prolongs the harvest time for many fruit products, and the geographic barriers of the Atacama desert, the Pacific ocean, the Andre mountains, and the southern polar ice fields protect production areas from pests and diseases.

4.1.1 Chilean deciduous fruit production

Chile is known for its wide array of deciduous fruits. Given its length and geographic position, the country produces immense varieties of fruits in diverse climates that are available year-round. Chile provides summer fruits to countries in the northern hemisphere

even during the middle of winter. It also provides winter fruits in the northern summer. According to Shearer (2004) the country, due to a high level of coordination, is able to supply fruits consistently over a long period of time to the marketplace, thereby satisfying customers and consumers. The deciduous fruit industry has been one of importance to Chile's overall economic success.

(a) Area planted

Chile's deciduous fruit growing area has been increasing dramatically since 1974. By 1986, the area planted to fruits had almost doubled to 130,000 ha. According to Sparks (1991), much of the increase in area planted was for table grapes, from 4,250 ha in 1974 to 36,000 ha in 1986 and 47,700 ha in 1989. Currently, the country has 7,800 fresh fruit growers harvesting about 462,000 hectares (Chilean Fresh Fruit Association, 2006).

According to the Chilean Fresh Fruit Association (2006), approximately 250,000 hectares (ha) of deciduous fruits are planted in Chile, mostly concentrated in the north-central and central area of the country (between parallels 25^0 and 35^0 south latitude). The main crops are table grapes and apples, with stone fruits becoming an increasingly important crop. There are 36 varieties of table grapes (with Thompson Seedless, Flame Seedless and Ribier accounting for the bulk of production); over 36 plum varieties (the Friar, Angelo, Larry Ann, Black Ambar and Laroda are the most popular varieties, which cover over 50 percent of the total planted area); over 36 varieties of peaches for fresh consumption; another 36 varieties of nectarines grown and exported; and over 36 varieties of pears (Packam's Triumph and Beurre Bosc making up over 60 percent of the country's exports) produced by the Chilean deciduous fruit industry (Hennicke, 2006). Considering the deciduous fruit varieties produced by South Africa in Chapter Three (section 3.4.1) and comparing them to the varieties produced by Chile, it is clear that Chile produces more deciduous fruit varieties than South Africa.

(b) Production

Chile has become one of the largest fresh deciduous fruit producers, producing 25 percent of total southern hemisphere deciduous fruits. Table 7 shows the production of different deciduous fruits in Chile. The general impression from Table 7 is that production of all

deciduous fruits is increasing. Production has doubled in the past 15 years. The 2003 season showed a sharp increase in total grape production. According to Hennicke (2004), the reason for an increase in total grape production during this period could be good weather that resulted in an increase in output of table grapes. Total grape production, according to Hennicke (2006), is forecasted to remain stable in 2006, as the northern production areas of Chile were affected by frost. Total apple production is forecasted to increase by 8 percent in 2006 as a result of good weather conditions. Total pear production is also expected to increase slightly in 2006, as the pear crop will benefit from positive growing conditions during the spring of 2006 season. Total plum production, on the other hand, is expected to fall in 2006. This is because of the mild temperature experienced last winter (May to August 2005), limited cold hours that affected budding adversely, and frost in early spring (end of August to September 2005) in some important plum production areas.

Considering the total production performance of different deciduous fruits in South Africa and comparing this to the total production performance of different deciduous fruits in Chile (Table 7), it is clear that Chile produces more grapes, apples, plums, peaches and nectarines than South Africa. Chile produces 25 percent of the total southern hemisphere deciduous fruits, whereas South Africa produces only 18 percent of the total southern hemisphere deciduous fruits.

Table 7: Production of different deciduous fruits in Chile (1000 tons)

Year	Grapes	Apples	Pears	Apricots	Plums	Peaches & nectarines
1991	1,186.39	780.00	165.00	11.20	100.00	200.00
1992	1,140.66	830.00	180.00	17.00	110.00	223.00
1993	1,300.22	840.00	210.00	20.00	120.00	237.00
1994	1,448.96	810.00	230.00	28.00	130.00	258.00
1995	1,526.16	850.00	280.00	30.00	140.00	275.00
1996	1,629.905	950.00	322.00	30.00	150.00	280.00
1997	1,669.19	845.00	300.00	28.00	158.80	242.00
1998	1,642.093	975.00	275.00	21.00	139.80	206.30
1999	1,575.00	1,175.00	265.00	25.00	186.70	252.60
2000	1,899.943	805.00	210.00	28.50	172.00	260.00
2001	1,800.548	1,135.00	205.00	20.50	210.50	290.00
2002	1,750.00	1,150.00	203.00	22.00	215.00	293.00
2003	1,985.00	1,250.00	205.00	26.00	255.00	304.00
2004	1,900.00	1,300.00	210.00	23.00	250.00	311.00
2005	2,250.00	1,350.00	212.00	24.00	255.00	315.00

Source: FAO, 2006

4.1.2 Chilean deciduous fruit export trends

Chile is the largest fresh deciduous fruit exporter located within the southern hemisphere; the main exports in this category are grapes, apples and pears. According to the latest figures from the FAO (2006), Chile represents approximately 48 percent of the southern hemisphere fresh deciduous fruit exports, therefore positioning it as the leader in exports from the region. The Chilean deciduous fruit industry is focused on export development and has the supply and export capability to supply fruits worldwide. Today, the industry exports to more than 100 different countries around the world, a clear indication of the diversification and the adaptation to market demand that characterises the industry (Chilean Fresh Fruit Association, 2006). In this section, Chile's total volume of different deciduous fruit products traded globally is discussed.

Figure 17 shows Chile's total exports of different deciduous fruits from 1991 to 2004. From Figure 17, it is clear that exports of all deciduous fruits have been fluctuating. Only grape exports increased substantially over the period depicted in Figure 7. According to

Hennicke (2006), the volume of grape exports for 2006 is expected to be similar to the previous years, due to adverse weather conditions in some grape growing areas that affected the performance and the quality of the production.

Apple exports increased largely because of stronger export demand, mainly from the EU markets, which contributed to this export expansion. According to Hennicke (2004), a reduction of duties to zero, for apple imports into the EU due to the Free Trade Agreement (FTA) between Chile and EU, has had some positive effect on total apple exports to the EU. While the country's primary southern hemisphere competitors are South Africa, Australia, New Zealand, and Argentina, Chile has surpassed them in capturing shares of the EU market. According to Hennicke (2006), strong apple demand due to lower production in Europe is expected to prompt increased exports in 2006.

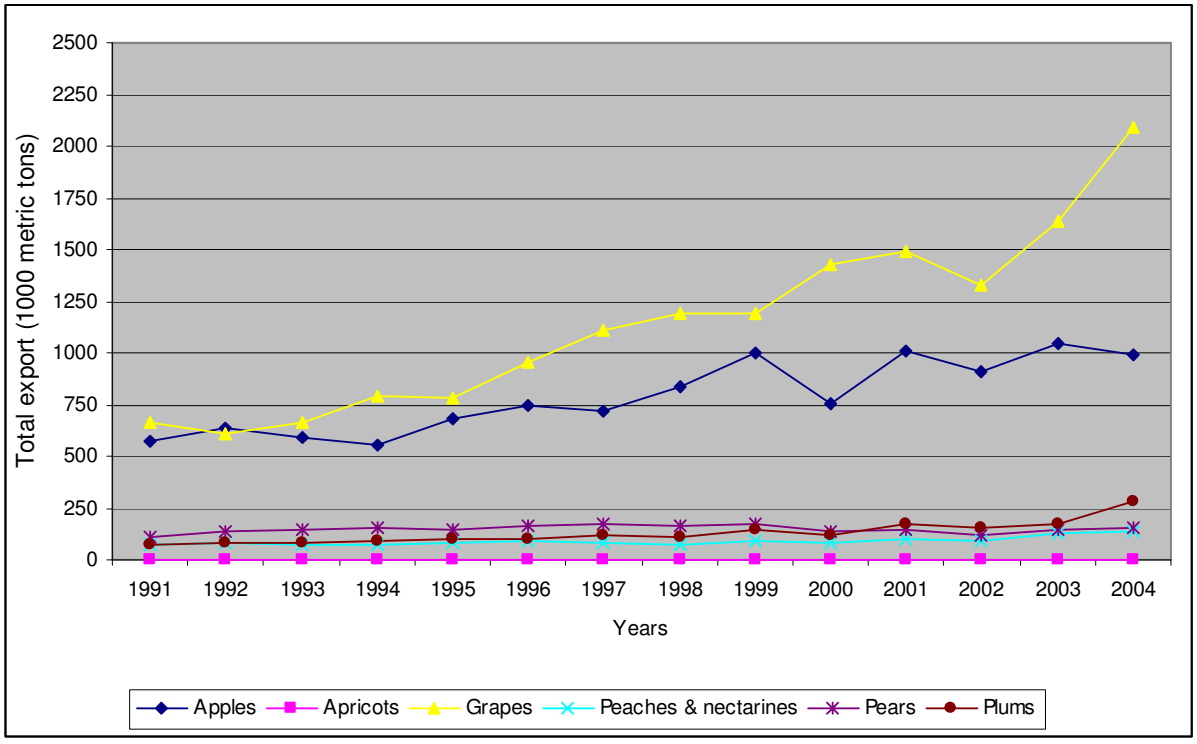


Figure 17: Chile's exports of different deciduous fruits in metric tons

Source: FAO, 2006

4.2. The Chilean deciduous fruit competitiveness trend

4.2.1 Apple competitiveness

Table 5 shows the competitiveness of the South African apple industry relative to other apple producing countries. According to this table, the competitiveness of the Chilean apple industry ranks 1st overall out of 28 apple-producing countries. It ranks 2nd in terms of production efficiency; 1st in terms of infrastructure and inputs; and 4th in terms of financial and market issues.

4.2.2. Pear competitiveness

The competitiveness of Chile's pears ranks 2nd overall out of the 18 major pear producing countries, as can be seen in Table 6. It ranks 16th in terms of production efficiency; 1st in terms of infrastructure and inputs; and 6th in terms of financial and market issues.

4.3 Factors determining the competitiveness of the Chilean deciduous fruit industry

Chile, like Australia, enjoys a number of advantages that benefit the production of fresh deciduous fruits. Production is counter-seasonal to the large northern hemisphere markets. The country's fruits ripen during the U.S and European winters; this lessens competition to the Chilean deciduous fruit industry from their export markets' domestic producers. Therefore, products are exported when they are scarce or unavailable north of the equator.

Chile is internationally recognised as a large producer of fresh deciduous fruits. It has a number of natural advantages in deciduous fruit production. According to Chilean Fresh Fruit Association (2006), the country has superior soil and water resources that are suitable for the production of deciduous fruits. Geographically, it encompasses a variety of excellent climatic conditions and therefore produces a large number of products at different times of the year (Shearer, 2004). It is relatively isolated physically, providing excellent natural protection from pests and diseases. According to Correa (2001), the geographical layout of Chile protects fruits from epidemics due to natural barriers. The

geographic configuration provides the country with excellent conditions of sanitary control, which are widely recognised internationally.

The recognition by the international market of 'fruit fly free' areas in Chile has been an important step in the fruit export sector's drive to strengthen and increase the presence of Chilean fruit in diverse markets around the world. This has led to the elimination of some phytosanitary restrictions, thus reducing export costs and increasing competitive market opportunities (Chilean Fresh Fruit Association, 2006).

According to Granger (2001), Chile has a superior business environment for the production and export of fresh fruit. The appropriate and stable macroeconomic environment in Chile has a positive impact on the development and competitiveness of the deciduous fruit industry. The key to the successful development of the Chilean deciduous fruit industry is the strong presence of foreign direct investment (FDI), in addition to the development of relationships leading to well integrated supply chains (Shearer, 2004). Chile is focused on export development and has attracted a significant amount of FDI to support the development of the fresh fruit industry. During 2002, overseas companies invested US$3.33 billion into Chile's economy, with most of this amount going to the fresh fruit industry. According to Shearer (2004), the industry has developed excellent relationships in the supply chain and has become the dominant deciduous fruit producer in the southern hemisphere.

Chile has a modern productive infrastructure. Due to the favourable conditions existing in Chile for deciduous fruit production, the process of incorporating modern technology has occurred smoothly over time (Correa, 2001). The Chilean deciduous fruit industry uses the latest production techniques and varieties in close association with the USA industry. According to Correa (2001), the industry uses trained professionals that are widely travelled and bring back the latest technology to the industry. This strong external orientation has the potential to develop the competitiveness of the industry.

There is also a well developed transportation infrastructure in Chile, and according to Shearer (2004), this gives the Chilean fruit industry a comparative advantage. Fresh fruits have easy and rapid access to shipping ports. Shearer (2004) point out that the location of ports is close to production areas. As a result, deciduous fruits are currently shipped to

every major port in EU, UK, US and Far East, which are South Africa's export destinations. Additionally, Correa (2001) argues that the use of the latest post-harvest technologies, including sea freight technologies, has greatly assisted the development and the competitiveness of the Chilean deciduous fruit export industry.

4.4 Conclusion

The purpose of this chapter was to give a descriptive overview of the Chilean deciduous fruit industry. The chapter provides an overview of the industry, with a special emphasis on production, export and competitiveness trends. The chapter concludes by looking at factors which determine the competitive success of the Chilean deciduous fruit industry.

Grapes are the most abundantly produced and exported deciduous fruit in Chile. Chile produces more grapes, apples, plums, peaches and nectarines than South Africa. It produces 25 percent of the total southern hemisphere deciduous fruits, whereas South Africa produces only 18 percent of the total southern hemisphere deciduous fruits.

As discussed earlier in this chapter, Chile has a number of advantages that benefit the production of deciduous fruits. Production is counter-seasonal to the large northern hemisphere markets. The country has superior soil and water resources, and it is isolated physically, providing excellent natural protection from pests and diseases. It has an appropriate and stable macroeconomic environment, a modern productive infrastructure, and a well-developed transportation infrastructure, which give the Chilean deciduous fruit industry a comparative advantage.

The next chapter (Chapter Five) provides a description of the methodology to be used in Chapter Six to measure the relative competitiveness of the South African and Chilean deciduous fruit supply chains.

CHAPTER FIVE: ANALYTICAL TECHNIQUES TO MEASURE COMPARATIVE AND COMPETITIVE ADVANTAGE

5.0 Introduction

Academic examination of the determinants of international competitiveness is certainly not a new topic, with much of the early intellectual effort in economics focused on understanding and explaining international comparative advantage (Smith, 1776 and Ricardo, 1951). Thurow (1992) states that in recent years the attention paid to competitiveness has intensified and expanded well beyond the walls of international scholarship.

The concepts of comparative advantage and competitiveness are the two most important foundations for understanding the importance of international trade, particularly in agriculture, and to clarify the underlying factors responsible for current trade patterns. A better understanding of how these two terms pertain to measuring and analysing an industry's global competitiveness is useful. Empirical measures of comprehensive competitiveness can identify the overall direction and driving force that a country's investment and trade should take in order to exploit international differences in product and factor supply and demand.

The purpose of this chapter is to describe the techniques or indexes to be used in Chapter Six to measure the comparative advantage and competitiveness of the deciduous fruit supply chains of both South Africa and Chile. Before any conclusions on comparative advantage and global competitiveness of the South African deciduous fruit industry relative to that of Chile can be reached, it is necessary to review a number of criteria and indexes that can be used to measure comparative advantage and competitiveness. A precise and reliable method for measuring competitiveness is critical in order to make valid comparisons across sectors and countries.

5.1 Problems with measuring competitive advantage

According to the OECD (2004) one of the biggest constraints involved in measuring competitiveness is the lack of reliable data on production costs at farm level, as few producers have good information about their cost structures. Competitiveness at production level is also strongly influenced by the prices farmers receive from their final output. The OECD (2004) states that production can be competitive over a wide range of farm sizes once the minimum farm size and technology level have been reached. The OECD (2004) argues that generally relative low productivity and the low quality of many products caused mostly by the twofold structure of agriculture, i.e. the small number of commercial farmers and the large number of subsistence farmers, generally hamper the attainment of a competitive supply chain.

5.2 Techniques to measure comparative and competitive advantage

According to Esterhuizen and Van Rooyen (1999) many diverse methods and indexes have been developed to measure comparative and competitive advantage. Turner and Van't Dack (1993) state that there are many methods that can be used to measure comparative advantage and competitiveness, and they argue that no single, comprehensive measure can be regarded as the appropriate indicator. They also argue that some measures are clearly defective and all are incomplete. The choice of measurement is thus influenced by the particular question or aspect of competitiveness that one wishes to deal with.

However, in a recent study by ISMEA (ISMEA, 1999), two methods were prioritised to determine the competitiveness of EU food chains in a global environment, namely, the well known approach to the study of competition originated by Porter (1990) and the competitiveness indicators as originally developed by Balassa (1977, 1986). In addition to these two methods, there are many other methods that can be used to measure comparative advantage and competitiveness, and these include Domestic Resource Cost (DRC), Policy Analysis Matrix (PAM) and the Trade Performance Index (TPI). According to Mucavele (2000) Net Social Profitability (NSP), Domestic Resource Cost (DRC), Resource Cost Ratio (RCR) and the Revealed Comparative Advantage (RCA) are all measurements of economic efficiency. This section discusses some of the indexes used in Chapter Six,

with Porter's competitive diamond model forming the basis of the discussion for these indexes.

5.2.1 Porter's competitive model

When and why is an industry internationally competitive? In order to find answers to these questions, Porter (1990) posed a third question: Why does an economy achieve international success in a particular industry? Porter (1990) emphasises that the latter question must be addressed before the first two questions can be answered. He argues that the question of why some nations succeed and others fail in international competition is one of the most frequently asked economic questions, and thus far, it is the wrong question to ask if the aim is to expose the underpinnings of economic affluence for either industries or nations.

According to Porter (1990), there has been no shortage of explanations for why some nations are competitive and others are not. The explanations prompted by this question are often conflicting, and there is no generally accepted theory. Some see national competitiveness as a macroeconomic phenomenon driven by variables such as exchange rates, interest rates and government deficits. Yet, some nations have enjoyed rapidly rising standards of living, despite budget deficits (for example, Korea, Japan and Italy), appreciating currencies (Switzerland and Germany) and high interest rates (Korea and Italy).

Some view competitiveness as a function of cheap and abundant labour. However, nations like Germany, Switzerland and Sweden have prospered despite high wages and long periods of labour shortages. Others argue that competitiveness depends on possessing abundant natural resources. Yet, the most successful trading nations, such as Switzerland, Germany, Italy, Korea and Japan, to mention just a few, are countries with limited natural resources that must import raw materials. A final popular argument for national competitiveness is differences in management relations. The problem with this argument, however, is that different industries require different approaches to management. What is regarded as good management in one industry might be overwhelming in another industry (Porter, 1990).

None of the above arguments for national competitiveness is sufficient by itself in understanding the competitive position of a nation's industries. These led Porter (1990) to develop a competitive diamond model that offers an explanation of national competitiveness. According to Porter (1990), competitiveness at a national level depends on:

- Product quality and features (which determine prices)
- Efficiency with which products are produced
- Capacity to compete in sophisticated industries
- Upgrading the competitive position
- Moving from competing on price and quality to higher margin levels
- Productivity, which leads to high wages and low inflation

Competitiveness is not a low currency, economic growth, a trade surplus and jobs, but productivity and a mix of trade (imports of low valued goods and exports of high valued goods). Competitive advantage results from rapid innovation and improvement, not static advantages. Innovation includes both technology and methods, and a sustainable competitive advantage requires the relentless broadening and upgrading of markets over time. Porter (1990) states that early movers often become international leaders.

Figure 18 presents the determinants of national competitive advantage (Porter's diamond model). According to Porter (1990), competitiveness lies in six broad criteria or attributes that shape the environment in which firms or industries compete. These are detailed next.

First, factor conditions: the nation's position with regard to the factors of production, such as skilled labour or infrastructure, knowledge, levels of production costs, e.g. the prices of diesel, labour, machinery and pesticides necessary to compete in a given industry. The fact that a country has good non-key factors, such as unskilled labour and raw materials, does not generate sustained competitive advantage, as these can be obtained by any industry. However, specialised key factors, such as skilled labour, capital and infrastructure, lead to a competitive advantage since these factors are more difficult to duplicate. According to Porter (1990), these key factors of production are created, not inherited.

Second, demand conditions: the nature of home demand for the industry's products and services and the ability to record this demand, for example, home demand composition, demand size, and internationalisation of domestic demand. Demand conditions are an important factor in helping to produce competitiveness. A sophisticated domestic market pressures a company, industry or nation to sell superior products. The fact that markets demand high quality products and close proximity enables companies or industries to better understand the needs and wishes of its customers.

Third, related and supporting industries: the presence or absence in the nation of supplier and related industries that are internationally competitive. Porter (1990) states that a set of strong related and supporting industries is important to the competitiveness of firms or industries. These industries include suppliers and related industries.

Fourth, firm strategy, structure and rivalry: the conditions in the nation governing how companies or industries are created, organised and managed, and the nature of domestic rivalry. The strategies of firms in the domestic capital market affect their competitiveness. According to Porter (1990), countries with a short-run point of view tend to be more competitive in industries where investment is short-term, and countries with a long-run outlook tend to be more competitive in industries where investment is long-term. Porter (1990) states that a country whose key personnel hold positions in a particular industry that are considered prestigious will be competitive in that industry. This phenomenon exists because individuals tend to base their career decisions on opportunities and prestige. Porter (1990) bases the structure of firms on management styles, which vary among industries. Some countries may be oriented toward a particular style of management. If a particular management style suits a country it will tend to be more competitive in those industries in which that management style dominates. Local rivalry also spurs innovation, which is needed for sustainable competition.

Fifth, government attitude and policy: government plays an important role, if not the most important role, in international competitiveness. It can influence each of the above determinants either positively or negatively through policy and operational capacity. All four determinants of competitive advantage discussed above can be influenced through a variety of government actions, such as subsidies to firms, either directly (money) or indirectly (through infrastructure); tax codes applicable to corporations, businesses or

property ownership; and the educational policies that affect the skill level of workers. That is why government, as a determinant of competitiveness, must be viewed apart from the above four determinants. Porter (1990) argues like everyone else that there are some things that governments do that they should not, and other things that they do not do but should. He states "government's proper role as a catalyst and challenger is to encourage - or even push companies to raise their aspirations and move to higher levels of competitive performance".

Sixth, the role of chance: events that have little to do with circumstances in a nation and are often largely outside the power of firms (and often the national government) to influence. Porter (1990) emphasises the role of chance in his model of competitive advantage, stating that random events can either be beneficial or harmful to a firm's or industry's competitive position. Events such as wars, political decisions by foreign governments, large increases in demand, shifts in world financial markets and exchange rates, discontinuity of technology or major technological breakthroughs or inventions, and input demand can be described as chance events.

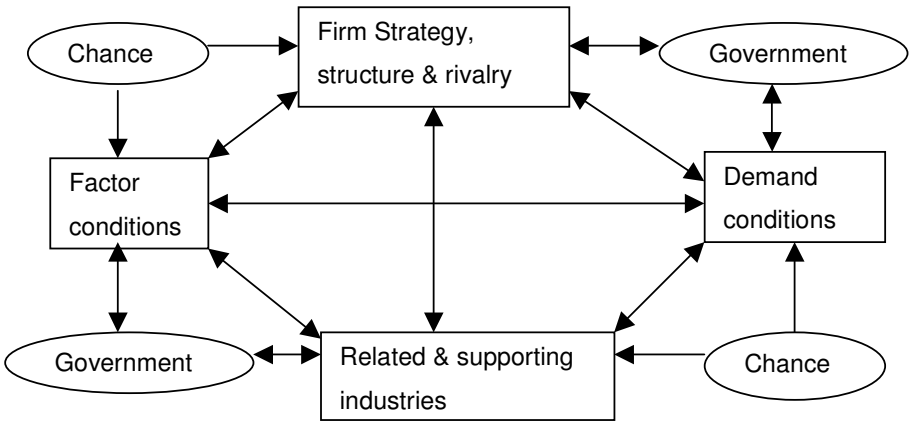


Figure 18: Determinants of national competitive advantage (Porter's diamond)
Source: Porter, 1990

Porter's model (1990) not only evaluates the competitiveness of the producers in the supply chain but that of all of the participants. This method allows one to identify and analyse the structure of a sector and to point out its strengths and weaknesses. Critical success factors can thus be identified by using the Porter diamond model, to which

participants in a supply chain have to pay special attention in order to successfully develop and sustain competitiveness. According to Galleto (2003), the Porter diamond model can be used to measure competitive potential or the competitive process, which is often of a more qualitative nature, and not competitive performance.

In South Africa, Porter's model (1990) has been widely used to measure competitiveness (Edwards *et al*. 2000; Edwards & Schoer, 2001; Esterhuizen & Van Rooyen, 1999; Valentine & Kransnit, 2000 and Van Seventer & Molate, 2002). Esterhuizen *et al*. (2002) state that it is interesting to note that the International Institute for Management Development (IMD) also uses Porter's diamond analysis (1990) for the World Competitiveness Report.

5.2.2 Revealed Comparative Advantage (RCA) index

Researchers have used a number of index measures of trade performance to study the structure and determinants of a country's foreign trade. A commonly used family of index measures are the indexes of trade intensity, the most popular member of this family being the index of revealed comparative advantage (RCA). In this section two revealed comparative advantage (RCA) measures are discussed. One is the original RCA index originated by Balassa (1965) and the other one is an improved version of the original Balassa (1965) RCA constructed by Vollrath (1991). Vollrath's (1991) RCA index will be denoted by RCA# for the purpose of differentiating it from Balassa's (1965) original RCA.

According to Galleto (2003) and Winkelman *et al*. (1995), the RCA index is one of the most popular and potent measures of industrial competitive performance, and it has been widely used in the agricultural and food industries. Bender and Li (2002) state that the RCA index assumes that a true pattern of comparative advantage could be observed from post-trade data.

The RCA index is widely used in practice to determine a country's weak and strong sectors. Liesner (1958) was the first to utilise an RCA index, the most frequently used measure of which is called the Balassa index, after its refinement and popularisation by Balassa (1965 & 1989). According to Vollrath (1991), Liesner was the first to use post-trade data in an effort to quantify comparative advantage. Liesner (1958) developed

indexes of relative export performance as proxies for comparative costs in an effort to assess the potential effects on British industry of an entry into the European common markets.

Balassa (1965), who first coined the term RCA, then adjusted Liesner's methodology in an attempt to identify the continuing effects of trade liberalisation resulting from the Kennedy Round of negotiations of the General Agreement on Tariffs and Trade (GATT) (Vollrath, 1991). Balassa's (1965) fundamental nature of normalised relative export measures was obtained by dividing a country's share in the export of a given commodity by the combined export of manufactured goods of the ten industrial countries under consideration.

Balassa's (1965) development of the RCA index model and its subsequent extension (Balassa, 1977) to encompass a stage approach to industrialisation was regarded as a major innovation.

The difficulty in measuring comparative advantage itself led Balassa (1965) to investigate trade patterns directly, without reference to underlying resources, productivity, subsidies, prices or support policies. For a particular country, Balassa (1965) defined the RCA of a product as the ratio of the share of that product in world trade. Balassa's RCA method, an *ex post* measure of competitiveness, compares a country's share of the world market in one commodity relative to its share of all traded goods. Given a group of reference countries, the Balassa RCA index basically measures normalised export shares, where the normalisation is with respect to exports of the same industry in the group of reference countries. In particular, if X_{Aj} is country A's export value of industry j, X_{refj} is industry j's export value relative to the group of reference countries, and we define $X_i = \Sigma j X_{ij}$ for i=A, ref, then country A's Balassa RCA index for industry j, i.e. RCA_{Aj}, equals:

$$RCA_{Aj} = (X_{Aj}/X_A)/(X_{refj}/X_{ref}) \text{----------(1)}$$

All values greater than one signal that the country has a comparative advantage in the production of that product and all values less than one signal a comparative disadvantage in the production of that commodity. In other words, if RCA_{Aj} exceeds 1, country A is said

to have a comparative advantage in industry j, since this industry is more important for country A's exports than the exports of the reference countries.

The RCA index is often multiplied by 100 for ease of presentation. An index of 110 for a particular industry in a particular country would then mean that its share of the world market in that industry was 10 percent higher than its share in total exports and that the country has a comparative advantage in that industry. Figures below 100 indicate comparative disadvantage.

The RCA index measure can therefore identify sectors for which an individual country has a comparative advantage and a comparative disadvantage. According to Pitts and Langnevik (1997), the RCA index measures relative success in exporting and, despite its name, is not dependent on any theory regarding inter-industry trade, factor endowments, or the existence or absence of free trade or perfect competition.

Balassa's RCA index method has a long history of practical use and has gained greater acceptance among applied trade economists. Soon after its development, it was widely adopted in agricultural sector studies. According to Hinloopen & Marrewijk (2001), use of the RCA index for identifying a country's weak and strong sectors is widespread, both among academic scholars and policy makers. Balassa (1977) himself used this index to measure the changing competitiveness of the United States economy in research intensive industries. Michael Porter (1990) in his influential book *The Competitive Advantage of Nations* used a Balassa RCA index exceeding one, in some cases strengthened to a Balassa index exceeding two, to identify a country's strong sectors. Other examples of empirical studies where the Balassa index is used include Ariovich (1979), Reza (1983), Yeats (1985), Peterson (1988), Crafts (1989), Amiti (1999), Valentine and Krasnik (2000), Esterhuizen & Van Rooyen (1999), Esterhuizen and Van Rooyen (2001), Van Rooyen *et al*. (2000), ISMEA (1999), Pitts *et al*. (2001), and Ferto and Hubbard (2001).

Hillman (1980), Bowen (1983, 1985, 1986), Balance *et al*. (1985, 1986), and Marchese & Dadal De Simone (1989) also analysed the properties of RCA indexes purported to approximate actual comparative and competitive advantage. Despite detailed discussion on the Balassa index [see Kunimoto (1977), Hillman (1980), Bowen (1983, 1985, 1986),

Balance *et al*. (1985, 1986), Vollrath (1991), Bowen *et al.* (1998), Hinloopen & Van Marrewijk (2001)], its distribution index cannot be derived theoretically. In addition, the Balassa index's distribution has not been systematically analysed empirically (Yeats, 1985). Specific Balassa index values are, therefore, sometimes difficult to interpret. Moreover, it is a priori not clear that a particular value for the Balassa RCA index implies the same extent of comparative advantage for different countries.

Bender and Li (2002) and Batha and Jooste (2004) point out that Balassa's RCA index faces measurement problems, as it is defined in terms of autarkic price relationships that are not observable. Trade statistics reflect only post-trade situations. Bender and Li (2002) further state that this approach, pioneered by Balassa (1965, 1977, 1979), assumes that the true pattern of comparative advantage can be observed from post-trade data. The availability of data at different levels of aggregation and the data bias caused by government policy distortions (e.g. non-trade barriers and export subsidies) caused immeasurable damage to the 'true' pattern of comparative advantage. Bender and Li (2002) and Batha and Jooste (2004) are, however, of the opinion that RCA measures are still acceptable since the impact of changes in trade policies can be deducted from movements of the RCA, even though it fails to distinguish between a region's factor endowments.

Vollrath (1991) improved the original version of Balassa's RCA index to reflect both imports and exports. According to Bender and Li (2002) and Batha and Jooste (2004), Vollrath's (1991) RCA# index is considered to be a more appropriate measure of comparative advantage because a group of countries is expected to have a much greater impact at the world level than an individual economy. The RCA# index considers the significance of a country's exports in a given sector and at the world level and eliminates any double counting problems in world trade. Vollrath's (1991) RCA# formula is expressed mathematically as:

$$RCA\#_i = \frac{\left\{\frac{X_{ij}}{\left(\sum_i X_{ij}\right) - X_{ij}}\right\}}{\left\{\frac{\left((\sum_j X_{ij}) - X_{ij}\right)}{\left((\sum_j \sum_i X_{ij}) - (\sum_j X_{ij})\right) - \left((\sum_i X_{ij}) - X_{ij}\right)}\right\}} \quad \text{.....2}$$

where X_{ij} are the exports of sector "*i*" of country "*j*"; $\sum_i X_{ij}$ are the total exports of country "*j*", $\sum_j X_{ij}$ are the world exports of sector "*i*", and $\sum_j \sum_i X_{ij}$ are total world exports.

An index of 1.1 for a particular industry (commodity) in a particular country means that its share of the world market is 10 percent higher than its share of total exports, and thus, this country has a revealed comparative advantage in the industry (commodity). An RCA# index lower than 1 indicates that the country has a comparative disadvantage.

Edwards and Schoer (2001) as well as Batha and Jooste (2004) state that there is generally no significant difference between the calculated RCA and RCA#. Edwards and Schoer (2001) and Batha and Jooste (2004) found no significant differences between empirically calculated RCA and RCA# indexes. Edwards and Schoer (2001) found a high degree of correlation between the RCA and RCA#, i.e. in general, the correlation coefficient exceeds 0.8. For this reason, only Vollrath's (1991) RCA# is to be used further on in Chapter Six to calculate the comparative advantage of the deciduous fruit supply chains.

5.2.3. Net Export index (NX_i)

The RCA has been widely criticised since it only takes into account exports, ignoring the level of imports. According to Vollrath (1991), with differentiated products, intra-industry trade, and flows of exports and imports, net trade effects should be taken into account. Balassa also proposed an alternative measure called the Net Export index (NX_i), where

net exports are exports minus imports. In order to calculate the index, net exports are divided by the total value of the trade (exports plus imports) of the commodity in question[3].

The NX_i index formula is expressed mathematically as:

$$NX_i = [(X_i - M_i)/(X_i + M_i)] \times 100 \text{ ----------(3)}$$

where X_i is exports and M_i is imports. An index with an upper limit of 100 indicates that there are no imports, and a lower limit of negative 100 indicates that there are no exports.

According to Galetto (2003), the Net Export Index (NX_i) has one problem: it does not take into account the overall level of trade in a specific commodity. This implies that a country that is relatively self-sufficient, with a small exportable surplus and no imports, would have an index of 100 and, therefore, appear to be very competitive, even though it hardly trades at all. For these reasons, Galetto (2003) recommended that both the RCA and NX_i should be used together in assessing and analysing the comparative advantage and competitiveness of a specific industry or commodity.

5.2.4 Relative Revealed Comparative Trade Advantage (RTA) index

Following the analyses of global competitiveness in agriculture (Vollrath, 1987 and 1989) and in view of the open world economy, Vollrath (1991) offered an alternative specification of revealed comparative advantage that can be used to measure competitiveness, namely, the Relative Revealed Comparative Trade Advantage (RTA) index. The RTA index describes a country's share of the world market pertaining to one commodity relative to its share of all traded goods, and it accounts for imports as well as exports. It implicitly weights revealed competitive advantage by calculating the importance of relative export and relative import competitive advantages. It is calculated as the difference between

[3] According to Traill and Gomes da Silva (1996), another alternative way to calculate the "Net Export Index" is to divide the numerator ($X_i - M_i$) by domestic production (Y_i), instead of total trade.

relative export advantage (RXA), which equates to the Balassa index[4], and its counterpart, relative import advantage (RMA).

The RTA index is mathematically expressed as follows:

$$RTA_{ij} = RXA_{ij} - RMP_{ij} \text{----------(4)}$$

$$RXA_{ij} = (X_{ij}/\Sigma_{l,\, l\neq j}\, X_{il}) \,/\, (\Sigma_{k,\, k\neq j}\, X_{kj} \,/\, \Sigma_{k,\, k\neq i}\, \Sigma_{l,l\neq j}\, X_{kl}) \text{----------(5)}$$

$$RMP_{ij} = (M_{ij} \,/\, \Sigma_{l,\, l\neq j}\, M_{il}) \,/\, (\Sigma_{k,\, k\neq i}\, M_{kj} \,/\, \Sigma_{k,\, k\neq i}\, \Sigma_{l,\, l\neq j}\, M_{kl}) \text{----------(6)}$$

where *X* and *M* refer to exports and imports respectively, with the subscripts *i* and *k* denoting product categories, while *j* and *l* denote country categories. The numerator in equations (5) and (6) is equal to a country's exports (imports) of a specific product category relative to the exports (imports) of this product from all countries, except for the country in consideration. The denominator reveals the exports (imports) of all products, except for the commodity in consideration from the respective country as a percentage of all other countries' exports (imports) of all other products. The level of these indicators represents the degree of revealed export competitiveness and import penetration. Values above zero point to a competitive trade advantage and values below zero point to a competitive trade disadvantage.

While the calculations of indexes RXA and RMP are exclusively based on either export or import values, only the RTA considers both export and import activities[5]. According to ISMEA (1999) this is important in view of trade theory and globalisation trends and due to the growth in intra-industry and/or entrepôt trade. Frohberg and Hartmann (1997) argue

[4] Vollrath's RXA differs from Balassa's RCA in that it eliminates country and commodity double counting, and it accounts for all traded goods and all countries, rather than sub-sets, and is therefore global in nature.

[5] This also holds for the net export index developed by Balassa (1989). Although this indicator is often used in studies of competitiveness, it is more suitable for measuring the intra-industry trade of a sector. As a matter of fact, this index is very similar to the Grubel-Loyd index of intra-industry trade. It is less suitable for providing an indication of competitiveness, since it does not take into consideration that competitiveness is a relative issue, which cannot be measured in absolute value (Ferto and Hubbard, 2001).

that the RMP index can be very misleading since it can be heavily distorted due to the protection of domestic markets.

In the extreme case of an import ban or a prohibitively high import tariff, the RMP measure indicates a high level of competitive advantage, and the reverse might be the case. Another factor that can lead to a distortion of all indicators considering exclusively either exports or imports is the existence of intra-industry trade. Pitts *et al*. (1995) argue that if, for example, a country acts only as a transit country, the RXA might indicate a high level of competitiveness that would be purely superficial. It is important in this respect what a particular country counts as exports, since there are unfortunately variations between different countries' records. Therefore, in considering both exports and imports, the RTA index is a more comprehensive and superior measure. It makes a clear distinction between a specific commodity and all other commodities, and between a specific country and the rest of the world, thus eliminating country and commodity double counting.

However, Frohberg and Hartmann (1997) argue that there are numerical problems with all three indexes, i.e. RTA, RXA and RMP. According to Frohberg and Hartmann (1997), the RXA and RMP are bound from below by zero, but unbound from above. The RTA is not bound from below either, but a switch in sign indicates a change in competitiveness. Where these indexes are completely bounded the interpretation of any value they take would be easier in the sense that one would be in a better position to asses the extent of a country's (lack of) competitiveness. Frohberg and Hartmann (1997) argue that it is also difficult to interpret the results of these three indexes if they show large annual fluctuations, which are due to structural changes. This is the case with most of the transition countries since their economies, including the agriculture and food sectors, are still under strong adjustment pressure, and the annual changes in trade structure are quite substantial. It is rather difficult to reach a conclusion regarding competitiveness under these conditions.

Pitts *et al*. (1995) also criticise a related problem in all three indexes. In their opinion these indexes cannot be compared across countries, since the size of a country affects the values. Let us assume countries *j* and *i* each export 50 percent of a commodity. Let country *i* be much larger and, therefore, have a considerably higher share than country *j* in total world trade in all other commodities. In this example, the RXA value for country *j* would exceed that of country *i*, even though both countries export the same share of the

product. Can country *j* be interpreted as being more competitive than country *i*? Pitts *et al*. (1995) deny this and argue that the size of the country should be taken into consideration. It is much more difficult for a small country to reach the same volume of export as a large one. Despite this shortcoming, all three indexes are still acceptable and they have been widely used to measure comparative and competitive advantage.

Vollrath (1987 & 1991) suggested other alternative specifications of the RTA index, which are simply the logarithm of the relative export advantage (lnRXA) and the revealed competitiveness (RC), mathematically expressed as:

$$RC = \ln RXA - \ln RMA \quad (7)$$

According to Vollrath (1987 and 1991), the advantage of expressing these indexes in logarithmic form is that they become symmetrical through their origin. Vollrath (1987 and 1991) suggested that the logarithmic form is preferable because it is less susceptible to policy-induced distortions, which tend to be more pronounced on the import side. Positive values of the RTA, lnRXA and RC indexes reveal a competitive advantage and vice versa.

A problem with these and similar indexes is that observed trade patterns are likely to be distorted by government policies and may therefore misrepresent underlying comparative and competitive advantages. This is especially true of the agricultural sector where government interference is commonplace, a point alluded to by Balassa (1965). Of the four indexes discussed above, namely, RCA, RTA, lnRXA and RC, only RCA and lnRXA embody export data, whereas the RTA and RC account for imports as well. For this reason, Vollrath (1991) suggests that the former two may be preferable because they are less susceptible to policy-induced distortions, which tend to be more pronounced on the import side.

Despite criticisms of the RTA index, it has been used by several researchers to measure the competitive performance of agricultural industries. Galetto and Cappellini (2003) used this index to measure the competitive performance of the western hemisphere's dairy industry. Esterhuizen and Van Rooyen (1999) also used this index to measure the competitiveness of South African agribusiness in the food commodity chain, as well as in the agro-food and fibre industries.

Care should be exercised when interpreting RTA indexes because, when comparing a cross-section of RTA indicators, different aspects of the formula can change and with them the interpretation of the RTA indicators. Table 8 gives some indication of how to interpret different cases of the RTA index. It is important to note that there are three aspects of the formula that can change when calculating RTA indicators. Firstly, there is the product or product group, secondly, there is the country or the group of countries for which one is estimating competitive advantage, and thirdly, there is the group of reference countries.

Consider case one in Table 8. A comparison of differences in the RTA indicators for different commodities or products traded for the same country with the same reference countries can make use of the real value of the RTA indicator. The higher the value of the indicator, the greater the competitiveness the product has over other products. Consider case two in Table 8. In this case a specific country's competitiveness for a specific product or commodity is compared against different reference countries. A comparison of the RTA indicator rank enables one to determine the relative importance of the traded commodity to those of different trading partners. In case three, special care needs to be exercised as different size economies will affect the absolute value of the RTA indicator. However, by using trend analysis, the competitiveness of different countries can be compared.

Table 8: A framework for interpreting different cases of the RTA index

CASE	COUNTRY OR GROUP OF COUNTRIES TO BE ANALYSED	COMMODITY PRODUCT OR COMMODITY GROUP	GROUP OF REFERENCE COUNTRIES	INTERPRETATION
1	Same	Different	Same	RTA indicators can be compared between products/commodities. The higher the value of the indicator, the greater the competitive advantages the product has over the other products in the country that has been analysed.
2	Same	Same	Different	A specific country's competitiveness for a specific product or commodity is compared to different reference countries. A comparison of the RTA indicator rank enables one to determine the relative importance of the traded commodity with different trading partners.
3	Same	Same	Same	Special caution needs to be exercised in this case. The index is affected by the size of the economy. Trends should preferably be used to compare competitiveness between the countries.

Source: Adapted from Valentine and Krasnik (2000).

5.3 Conclusion

The objective of this chapter, which was to describe the techniques or indexes to be used in the next chapter to measure competitiveness of the deciduous fruit supply chains, has been accomplished. Three internationally recognised measures of comparative advantage and competitive performance are to be used in Chapter Six, namely the index of RCA# by Vollrath (1991), the Net Export index (NX_i) and Vollrath's (1991) improved version of Balassa's RCA index, the RTA index. These indexes fit into this study because they produce accurate results, even though they have shortfalls. All of these indexes have been used definitely at the same time by Drescher and Maurer (1999) and Galleto (2003) for the analysis of competitiveness in the European dairy industries and competitive performance in the western hemisphere dairy industry respectively.

The first two measures, recommended by Galleto (2003), namely, the RCA# and the NX_i are used in Chapter Six as complementary measures, and the RTA index is used independently as an alternative to the other two. Each of these indicators is calculated in Chapter Six using trade data for deciduous fruit products for the period 1995-2003.

CHAPTER SIX: DESCRIPTION AND INTERPRETATION OF RESULTS

6.0. Introduction

Chapter Five described the methodology to be used in this chapter to measure the competitiveness of supply chains. The challenge now is to measure, analyse and compare the competitive status of the South African and Chilean deciduous fruit industries' supply chains. The reasons for comparing the competitiveness of South African deciduous fruit supply chains with those of Chile are: first, South Africa and Chile enjoy the same counter-seasonal advantage to access developed country markets, particularly those of the EU, UK, US and Far East. Second, the Chilean deciduous fruit industry constitutes a major competitive force in South Africa's export destinations, namely, the EU, UK, US and Far East markets. A comparative study on competitiveness between these two countries will thus provide valuable information and intelligence in an era where bilateral trade relations are becoming increasingly important. It is further also necessary to compare the South African deciduous fruit industry performance post-deregulation with that of its main competitors in the southern hemisphere, Chile in this case. Thus, a comparison of these two countries will present a realistic picture of South Africa's future prospects in the EU, UK, US and Far East markets.

The purpose of this chapter is, thus, to apply the indexes discussed in the previous chapter, namely, the RCA#, NX_i and the Vollrath's (1991) improved version of Balassa's (1965 and 1989) original version, the RTA index, to determine the competitive status of the deciduous fruit supply chains of both South Africa and Chile. Data including total world exports, as well as exports of the different deciduous fruit products in the supply chains of South Africa, Chile and the world (FAO, 2005) are used.

As recommended by Galetto (2003), the RCA# and NX_i indexes are used together to assess the competitiveness of the deciduous fruit supply chains in the next section. This is because, according to Galetto (2003), the NX_i index does not take the overall level of trade in a specific commodity into account.

6.1. Comparative advantage of South Africa's deciduous fruit supply chains

In this section the results of applying both the RCA# and the NX_i indexes simultaneously to the deciduous fruit industry are discussed. It should be noted at this point that any measure of the revealed comparative advantage (RCA) can be distorted by aggregation and policy effects. The availability of data at different levels of aggregation and data bias caused by government policy distortions (e.g. non-trade barriers and export subsidies) caused immeasurable damage to the 'true' pattern of comparative advantage. This is especially true of the agricultural sector, where government interference is commonplace. Therefore, readers should give careful thought to the level of aggregation at which RCA# indexes are constructed. Further, RCA# indexes are static in nature and compare a country's share of the world market in one commodity relative to its share of all traded goods. Policy makers should, therefore, be encouraged to interpret RCA# index results with caution.

6.1.1. Comparative advantage of the grape supply chain

Table 9 depicts the RCA# index for grapes at its different stages. For the whole period represented in Table 9 South African grape products (grape juice and raisins) have RCA# index values bigger than 1, indicating a revealed comparative advantage. Raisins started from a marginal revealed comparative advantage in the period 1995, but since then they have achieved strong comparative advantage, with an RCA# index value of 10.96 in 2003.

According to Galetto (2003), an RCA# index value higher than 10 for a specific product of a country shows a strong comparative advantage for this product. For the whole period in Table 9 South African grapes at primary form had most of their RCA# values remaining at more than 10, indicating that South Africa had a strong revealed comparative advantage, except in 1996 when it experienced a marginal revealed comparative advantage. Of the various products in the grape supply chain; only raisins displayed a strong revealed comparative advantage in 1997, 1999 and 2003. Grape juice, on the other hand, has RCA# values for the whole period that are less than 10, indicating a marginal comparative advantage. The grape industry has marginal comparative advantage because it planned for a weak rand and because South Africa has poor natural resources compared to Chile.

Table 9: RCA# index for different grape products in the supply chain

Chain	Product	RCA# 1995	RCA# 1996	RCA# 1997	RCA# 1998	RCA# 1999	RCA# 2000	RCA# 2001	RCA# 2002	RCA# 2003
Grape chain	Grapes	11.39	8.32	11.07	13.24	17.55	14.67	11.88	10.74	12.75
	Grape juice	6.19	3.58	3.39	5.01	5.74	7.90	6.02	6.15	4.55
	Raisins	6.46	6.96	10.52	5.86	10.86	7.09	8.13	9.83	10.96

Source: Own calculations based on data from FAOSTAT 2005

In Table 10 the NX_i index for grapes and the different products in its supply chain are given. As mentioned earlier in Chapter Five, an upper limit of 100 indicates no imports and a lower limit of negative 100 indicates no exports.

South African grape juice shows a positive net export value for the whole period (Table 10), except for 1996 and 1997, when South Africa was a net importer. The reason for this could be the deregulation of the industry which increased the vulnerability of producers to external commercial risks. Deregulation led to a short-term shortage of essential services formerly provided by the boards, such as storage, value adding and processing. The NX_i index for grapes and raisins, on the other hand, indicates a strong net export for the whole period (Table 10) with values mostly between 75 and 100. The NX_i shows no difference from the RCA# index, both telling the same story of the grape chain experiencing marginal comparative advantage.

Table 10: NX_i index for the grape supply chain

Chain	Product	NX_i 1995	NX_i 1996	NX_i 1997	NX_i 1998	NX_i 1999	NX_i 2000	NX_i 2001	NX_i 2002	NX_i 2003
Grape chain	Grapes	99.18	99.33	98.98	98.98	99.87	99.76	99.87	99.12	99.01
	Grape juice	42.33	(17.76)	(15.74)	49.72	95.52	93.60	84.73	92.22	29.27
	Raisins	100	100	98.97	99.44	99.03	91.89	96.78	99.16	98.87

Source: Own calculations based on data from FAOSTAT 2005

6.1.2 Comparative advantage of the pome fruit supply chains

Table 11 indicates RCA# index values for pears and the different apple products in its supply chain. According to this table, concentrated apple juice started from a revealed comparative disadvantage in the period 1995 to 2002 but managed to achieve a marginal revealed comparative advantage, with an RCA# index value of 4.55, in 2003. Apple juice, on the other hand, had a marginal revealed comparative advantage from 1995 to 2002 but reached a revealed comparative disadvantage, with an RCA# index value of 0.81, in 2003. Fresh apples and pears had RCA# index values for the period that are mostly between 5 and 10, an indication that South Africa had a marginal comparative advantage with these products. According to Table 11, pears only experienced a strong revealed comparative advantage in 1997 and 1999 with RCA# index values of more than 10.

Table 12 shows the NX_i index for pome fruits. From this table it is clear that pears and all products in the apple supply chain are exported. Apples, apple juice (including concentrated apple juice) and pears show positive net export index values, an indication that South Africa was a net exporter of these products from 1995 to 2003. The NX_i index for apples, apple juice and pears indicates strong net export values for the whole period depicted in Table 12.

Table 11: RCA# index for the pome fruit supply chain

Chain	Product	RCA# 1995	RCA# 1996	RCA# 1997	RCA# 1998	RCA# 1999	RCA# 2000	RCA# 2001	RCA# 2002	RCA# 2003
Apple chain	Apples	7.18	5.28	7.36	9.54	8.26	6.46	6.32	6.45	9.01
	Apple juice	8.98	10.24	12.49	5.88	13.18	12.05	8.69	3.10	0.81
	Concentrated apple juice	0	0	0	0	0	0	0	0	4.55
Pear chain	Pears	7.30	6.05	10.77	8.64	10.65	8.51	6.15	7.96	8.84

Source: Own calculations based on data from FAOSTAT 2005

Table 12: NX_i index for the pome fruit supply chain

Chain	Product	NX_i 1995	NX_i 1996	NX_i 1997	NX_i 1998	NX_i 1999	NX_i 2000	NX_i 2001	NX_i 2002	NX_i 2003
Apple chain	Apples	100	99.99	100	97.17	100	100	100	99.99	99.93
	Apple juice	70.77	78.14	96.49	40.46	69.38	70.59	88.80	57.89	87.66
	Concentrated apple juice	-	-	-	-	-	-	-	-	54.62
Pear chain	Pears	100	100	100	99.88	100	100	100	100	100

Source: Own calculations based on data from FAOSTAT 2005

6.1.3 Comparative advantage of the stone fruits supply chain

Table 13 indicates RCA# index values for the stone fruit supply chains. From these calculations it is clear that both fresh and dry apricots exhibit positive RCA# index values lower than 10, an indication that South Africa has a marginal revealed comparative advantage for these products. RCA# index values for plums are mostly above 10 for the rest of the period, except in 1995 and 1996, an indication that plums experienced strong revealed comparative advantage from 1996 until 2003. The RCA# for dried plums, on the other hand, shows that South Africa had a revealed comparative disadvantage for this product for the whole period, with RCA# values below 1. As outlined in Chapter Three, nectarines and peaches are closely related and most of the statistics treat the two as one. From Table 13 it is clear that nectarines and peaches started from a comparative disadvantage in the period 1995 to 1996 but achieved a marginal comparative advantage from 1997 to 2003, with RCA# index values of less than 10.

Table 14 indicates the net export index for stone fruits. It is apparent that South Africa was a net exporter of all stone fruit products, i.e. apricots, dry apricots, nectarines and peaches, plums and dried plums (prunes) for the whole period depicted in the table, except in 1997 and 2003 when South Africa was a net importer of dried plums (prunes). All of the products indicate a strong net export with high NX_i values, except for dried plums (prunes).

Table 13: RCA# index for the stone fruit supply chain

Chain	Product	RCA# 1995	RCA# 1996	RCA# 1997	RCA# 1998	RCA# 1999	RCA# 2000	RCA# 2001	RCA# 2002	RCA# 2003
Apricot chain	Apricots	1.67	0.69	5.31	3.86	6.27	6.74	4.64	4.05	4.61
	Dry apricots	6.29	3.98	4.09	4.19	4.41	3.84	6.13	4.82	4.46
Nectarine & Peach chain	Nectarines & peaches	0.30	0.84	1.57	1.36	1.99	1.71	1.33	1.46	1.29
Plum chain	Plums	9.69	9.46	14.63	13.28	23.53	14.61	12.81	12.55	15.25
	Dried plums (prunes)	0.22	0.39	0.10	0.087	0.18	0.32	0.14	0.13	0.07

Source: Own calculations based on data from FAOSTAT2005

Table 14: NX_i index for the stone fruit supply chain

Chain	Product	NX_i 1995	NX_i 1996	NX_i 1997	NX_i 1998	NX_i 1999	NX_i 2000	NX_i 2001	NX_i 2002	NX_i 2003
Apricot chain	Apricots	90.54	100	99.44	100	99.58	100	99.21	99.03	96.91
	Dry apricots	94.57	88.67	76.96	82.42	94.74	73.84	90.39	90.89	79.49
Nectarine & Peach chain	Nectarines & peaches	85.47	98.21	99.95	98.47	99.29	99.28	99.93	99.17	99.17
Plum chain	Plums	98.67	98.41	100	99.38	99.65	98.49	99.41	99.49	99.79
	Dried plums (prunes)	12.89	64.45	(6.82)	22.54	16.95	63.68	39.69	27.13	(9.33)

Source: Own calculations based on data from FAOSTAT 2005

6.2. Competitiveness of South Africa's deciduous fruit supply chains

The Revealed Comparative Advantage (RCA#) method used in the previous section compares a country's share of the world market in one commodity with its share of all traded goods. The Net Export index (NX_i), also used in the previous section, does not take the overall level of trade in a specific commodity into account. In this section trends in the global competitiveness of the South African deciduous fruit industry for the different supply chains are calculated using the Relative Revealed Comparative Trade Advantage (RTA) index. This specific index is a comprehensive and superior measure of competitiveness,

given the fact that it takes both imports and exports into account and it eliminates double counting.

6.2.1 Competitiveness of the grape supply chain

In Table 15 RTA index values are calculated for different grape products in the supply chain in South Africa for the last nine years. According to Scott and Vollrath (1992) and Galetto and Cappellini (2003), positive RTA indexes indicate a global competitive advantage and vice versa.

From Table 15 it is clear that RTA index values for the different products in the grape supply chain are mostly positive, with values mostly less than 10. This indicates that most South African grape products in the grape supply chain experienced a marginal global relative competitive advantage, except for grape juice from 1996 to 1997, which experienced a global competitive disadvantage.

RTA index values for grapes in their primary form, on the other hand, mostly displayed positive values greater than 10, an indication that South Africa has a strong relative global competitive advantage in fresh grapes. The RTA calculations agree with the analysis based upon the combination of the RCA# and NX_i indexes, identifying South Africa as having a marginally competitive grape supply chain.

Table 15: Competitive advantage of South Africa's grape supply chain (RTA index)

Chain	Product	RTA 1995	RTA 1996	RTA 1997	RTA 1998	RTA 1999	RTA 2000	RTA 2001	RTA 2002	RTA 2003
Grape chain	Grapes	11.30	8.27	10.98	13.13	17.43	14.58	11.83	10.66	12.65
	Grape juice	3.41	(1.63)	(0.78)	3.18	5.59	7.66	5.51	5.90	2.34
	Raisins	6.46	6.96	10.47	5.84	10.79	6.80	7.99	9.79	10.89

Source: Own calculations based on data from FAOSTAT 2005

Notes: RTA>0⇒Global competitive advantage; RTA<0⇒Global competitive disadvantage

6.2.2 Competitiveness of South Africa's pome fruit supply chain

Table 16 shows the global competitiveness of the South African pear and apple supply chains. From this table it is clear that the RTA index values for different products in the apple supply chain are mostly positive, indicating that all products in the apple chain experience a relative global competitive advantage, except for concentrated apple juice from 1995 until 2002, when this product experienced a relative global competitive disadvantage. The reason for the marginal competitive advantage of apple industry could be the deregulation which affected the industry negatively. According to Vink (2003) the apple industry was hardest hit, and experienced a decline in exports in the period immediately after deregulation in the mid to late 1990s. There was a sharp decline in quality and value of South African deciduous fruits delivered into a global market immediately after deregulation.

Pears also show positive RTA values of less than 10, indicating that South Africa experienced a marginal relative competitive advantage for pears for the whole period depicted in Table 16, except in 1997 and 1999 when this product experienced a strong relative competitive advantage. The RTA and RCA# indexes tell the same story, both indicating that South Africa's pome fruit supply chains basically experienced a marginal global competitive advantage.

Table 16: Competitive advantage of South Africa's pome fruit supply chain

Chain	Product	RTA 1995	RTA 1996	RTA 1997	RTA 1998	RTA 1999	RTA 2000	RTA 2001	RTA 2002	RTA 2003
Apple chain	Apples	7.15	5.26	7.33	9.37	8.23	6.44	6.31	6.44	8.90
	Apple juice	7.89	9.19	12.32	3.69	10.97	10.22	8.13	1.93	0.75
	Concentrated apple juice	0	0	0	0	0	0	0	0	3.59
Pear chain	Pears	7.29	6.05	10.75	8.62	10.64	8.50	6.14	7.95	8.83

Source: Own calculations based on data from FAOSTAT 2005

Notes: RTA>0⇒Global competitive advantage; RTA<0⇒Global competitive disadvantage

6.2.3 Competitiveness of South Africa's stone fruit supply chain

Table 17 indicates RTA index values for the different stone fruit products in the supply chain. According to this table, RTA index values for both fresh and dry apricots depict positive values that are less than 10, an indication that South Africa has a marginal relative global competitive advantage in fresh and dried apricots. RTA values for nectarines and peaches are also mostly positive, indicating that these products experienced marginal relative global competitive advantage for the whole period depicted in Table 17.

RTA values for the plum supply chain, on the other hand, indicate that dried plums experienced a marginal relative global competitive advantage, except in 1997 and 2003, when this product experienced negative RTA values, showing a relative global competitive disadvantage during this time. However, plums in their primary form experienced a strong relative global competitive advantage for the whole period, except in 1995 and 1996 when this product experienced a marginal relative competitive advantage. The RTA index agrees with the RCA# and NX_i analysis done in the previous section, both indicating that most of the products in the South African stone fruit supply chains experienced a marginal relative global competitive advantage.

Table 17: Competitive advantage of South Africa's stone fruit supply chain

Chain	Product	RTA 1995	RTA 1996	RTA 1997	RTA 1998	RTA 1999	RTA 2000	RTA 2001	RTA 2002	RTA 2003
Apricot chain	Apricots	1.59	0.69	5.29	3.86	6.26	6.74	4.62	4.03	4.55
	Dry apricots	6.11	3.75	3.66	3.80	4.28	3.30	5.82	4.59	4.01
Nectarine & Peach chain	Nectarines & peaches	0.28	0.83	1.57	1.35	1.99	1.71	1.33	1.46	1.29
Plum chain	Plums	9.63	9.39	14.62	13.23	23.47	14.51	12.77	12.52	15.23
	Dried plums (Prunes)	0.012	0.29	(0.007)	0.025	0.029	0.24	0.07	0.047	(0.0079)

Source: Own calculations based on data from FAOSTAT 2005

Notes: RTA>0⇒Global competitive advantage; RTA<0⇒Global competitive disadvantage

In summing up, the RCA# and RTA analysis shows that the South African deciduous fruit industry has a marginal comparative and competitive supply chain. The analysis also shows that the competitiveness of the South African deciduous fruit supply chains decreases when moving from primary to processed products. One possible explanation for this could be the high rates of return recorded for farm-level applications of technology for most primary deciduous fruit commodities. Value added activities higher up in the agricultural supply chain were somewhat ignored within agricultural research and development (R&D) expenditures. According to Esterhuizen *et al*. (2001), historically agricultural R&D focused on farm-level innovation. This led to high rates of return at this level. This phenomenon can, to some extent, explain why there is a decline in competitiveness in deciduous fruit supply chains when moving from the primary to processed products. To reverse this situation, more direct investments in R&D within the value adding activities in the industry's supply chain is required.

The marginal competitiveness of the industry, on the other hand, is attributed to the high input costs combined with low productivity, poor business strategies and inefficiencies, and unfair trade practices by the country's competitors (NDA, 2001). Cassim *et al*. (2002) also argue that the key problem that South African agriculture faces is a tariff structure that remains cumbersome with some 47 *ad valorem* tariff bands, with over 7000 lines. The structure of the tariff schedule has an important bearing on efficiency and subsequently on the competitiveness of agriculture, including the deciduous fruit industry. Cassim *et al*. (2002) argue that a uniform tariff rate is likely to create higher efficiency in the agricultural sector while creating less arbitrary protection of the sector. According to them, with a uniform tariff rate, it will be easier to bring imported intermediate inputs into the country, which are important for the international competitiveness of the industry. Some of the current factors impacting on the competitiveness of the South African deciduous fruit industry are discussed in section 6.5.

6.3 Competitiveness of Chile's deciduous fruit supply chains

Chile is the one of the biggest deciduous fruit producers in the Southern hemisphere and is South Africa's biggest competitor in the EU, UK, US and Far East markets. The Chilean deciduous fruit industry shares a counter-seasonal advantage with the South African deciduous fruit industry, and it competes directly with South Africa. The first part of this

section gives a comparison of the revealed comparative advantage based on an RCA# index analysis of both South Africa and Chile, and the second part gives a comparison of the relative competitiveness of these two countries based on the RTA index analysis.

6.3.1 Comparative advantage of Chile's deciduous fruit supply chains (RCA# index)

Considering the grape chain RCA# index values for Chile in Table 18 and comparing them to the grape chain RCA# index values for South Africa in Table 9, it is clear that Chile has a strong revealed global comparative advantage over South Africa's grape chain. South Africa experienced a marginal global comparative advantage with its entire grape chain, except for raisins in 1997, 1999 and 2003, when this product experienced a strong revealed comparative advantage. Chile has a higher global revealed comparative advantage for grapes in their primary form, grape juice and raisins than South Africa.

Considering the pome fruit chain RCA# index values for South Africa in Table 11 and comparing them to the pome fruit chain RCA# index values for Chile in Table 18, it is clear that Chile's pome fruits supply chain has a relatively better global revealed comparative advantage for apples, concentrated apple juice and pears than South Africa. South Africa, on the other hand, has a better global revealed comparative advantage only for apple juice than Chile.

Tables 13 and 18 clearly illustrate that Chile's stone fruits supply chain has a relatively better global revealed comparative advantage for apricots, nectarines and peaches, and plums (both fresh and dried or prunes) than South Africa. For apricot products to which value has been added (i.e. dried apricots), South Africa has a much better global comparative advantage than Chile.

Table 18: RCA# index for Chile's deciduous fruit supply chain

Chain	Product	RCA# 1995	RCA# 1996	RCA# 1997	RCA# 1998	RCA# 1999	RCA# 2000	RCA# 2001	RCA# 2002	RCA# 2003
Grape chain	Grapes	67.98	92.17	75.75	83.65	72.49	90.03	77.11	116.85	105.75
	Grape juice	17.89	24.17	9.51	22.79	5.64	7.44	14.39	12.51	11.50
	Raisins	14.75	17.11	20.84	20.14	22.36	25.90	24.82	25.49	23.78
Apple chain	Apples	21.89	25.51	24.25	35.64	32.10	28.91	36.36	37.92	29.84
	Apple juice	0	0	0	0	0	0	0	0	0.00422
	Concentrated apple juice	23.07	32.83	25.55	22.26	36.13	23.54	36.18	29.66	28.53
Pear chain	Pears	20.18	26.79	24.66	26.89	25.61	22.71	22.14	22.17	21.77
Apricot chain	Apricots	4.88	5.64	3.22	7.55	5.55	8.36	6.89	8.79	6.95
	Dried apricots	0.34	0.28	0.0022	0.014	0.21	0.16	0.19	0.31	0.029
Nectarine & peach chain	Nectarines & peaches	22.84	30.42	21.76	19.12	27.58	26.19	27.42	33.26	26.77
	Plums	54.17	67.88	57.27	57.54	74.93	63.36	77.19	92.05	70.46
	Dried plums (prunes)	32.74	36.11	30.99	36.03	37.41	41.84	49.89	53.11	55.81

Source: Own calculations based on data from FAOSTAT 2005

6.3.2 Competitiveness of Chile's deciduous fruit supply chains (RTA index)

Considering the RTA index values for Chile's grape chain in Table 19 and comparing them to the RTA index values for South Africa in Table 15, it is clear that Chile has a more globally competitive grape chain than South Africa. South Africa is experiencing marginal global competitive advantage for most of the products in the grape supply chain. Chile, on the other hand, has a better relative global competitive advantage for grapes in their primary form, grape juice and raisins than South Africa.

According to Tables 16 and 19, the RTA index values show that Chile's pome fruits supply chain has a relatively better global competitive advantage for apples in their primary form,

concentrated apple juice and pears than South Africa. South Africa's pome fruits chain has a much better relative global competitive advantage only in apple juice than Chile.

Considering the RTA index values for the stone fruits chain of South Africa in Table 17 and comparing them to the RTA values for Chile's stone fruits chain in Table 19, it is clear that Chiles' stone fruits supply chain has a relatively better global competitive advantage for apricots in their primary form, nectarines and peaches in their primary form, plums in their primary form and dried plums than South Africa. However, South Africa has much better global competitive advantage in dried apricots than Chile.

Table 19: Competitive advantage of Chile's deciduous fruit chain

Chain	Product	RTA 1995	RTA 1996	RTA 1997	RTA 1998	RTA 1999	RTA 2000	RTA 2001	RTA 2002	RTA 2003
Grape chain	Grapes	66.57	89.65	73.86	81.42	70.78	87.60	75.19	112.71	102.25
	Grape juice	14.79	22.71	8.76	22.16	5.05	6.98	13.80	9.97	8.41
	Raisins	14.72	17.08	20.79	20.08	22.31	25.83	24.76	25.40	23.72
Apple chain	Apples	21.64	25.16	23.98	35.09	31.67	28.64	35.89	37.36	29.48
	Apple juice	(0.075)	(0.17)	0	0	0	0	0	(0.014)	(0.0055)
	Concentrated apple juice	22.99	32.69	25.42	22.17	35.94	23.46	36.06	29.59	28.47
Pear chain	Pears	20.11	26.67	24.56	26.78	25.51	22.63	22.07	22.09	21.70
Apricot chain	Apricots	4.88	5.63	3.22	7.55	5.55	8.36	6.89	8.79	6.94
	Dried apricots	0.29	0.16	(0.059)	(0.097)	0.19	0.07	0.026	0.099	(0.26)
Nectarine & Peach chain	Nectarines & peaches	22.76	30.29	21.69	19.06	27.49	26.11	27.31	33.11	26.66
Plum chain	Plums	54.04	67.66	57.08	57.37	74.67	63.21	76.93	91.69	70.23
	Dried plums (prunes)	32.47	35.91	30.94	35.97	37.31	41.69	49.79	52.55	53.82

Source: Own calculations based on data from FAOSTAT 2005

Notes: RTA>0⇒global competitive advantage; RTA<0⇒global competitive disadvantage

In summing up, Chile has better global comparative and competitive advantage on the deciduous fruit supply chains than South Africa. This is because of this country's success in high-value agricultural exports that was based on world market demand. Chile's deciduous fruit export structure is highly dominated by high-value products relative to that of South Africa. This success arises from a series of reforms moving the country away from the initial import substitution industrialisation model. Internally, the export promotion strategy implied the following policies: a competitive exchange rate policy, reducing unilaterally import duties, streamlining export procedures, supporting a large number of export promotion institutions and opening up the economy to foreign direct investment (FDI). Externally, the strategy was based on very active trade diplomacy and numerous trade agreements (Anonymous, 2005).

On the other hand, the government of Chile initiated an Export Promotion Fund for agricultural promotion in 1995 to assist agricultural groups to develop either new markets for traditional products or to promote new-to-market products for them to become competitive. The government of Chile played and still plays a direct role in supporting its fruit sector. During 1997 direct government support to export promotion was estimated at $9.9 million. Private sector contributions to the Export Promotion Fund and to the Chilean Exporters Association were estimated at $7.2 million. Another device Chile used to encourage exports by small- and medium-sized companies is a simplified duty drawback system designed to refund duties paid on imported inputs without creating an excessive documentation burden. Non-traditional products with a total export value under $21 million were given a refund of between three and ten percent of the Free On Board (FOB) value of their exported merchandise (FAS, 1997). Chile's deciduous fruit competitiveness has also been achieved by focusing on comparative advantage, combined with foreign investment or partnerships, subsidies, tax exemptions, duty drawback schemes, publicly provided market research and public initiatives fostering scientific expertise.

6.4 Trends in the South African and Chilean deciduous fruit supply chains

Table 20 summarises the RTA index of the South African and Chilean deciduous fruit industries, indicating the trends in the different deciduous fruit supply chains. According to this table, Chile's grape chain exhibits a strong global competitiveness and a downward trend for all of the products in the chain. The South African grape chain, on the other hand,

shows a marginal global competitive advantage for most of the products in the chain, with a positive trend for all products in the chain except for grape juice, which has a negative trend.

In the apple supply chain, Chile has a strong relative global competitive advantage for all products in the chain except for apple juice, which experienced a relative competitive disadvantage, with all products in Chile's apple chain experiencing a negative trend. South Africa, on the other hand, has a marginal relative global competitive advantage with a positive trend for all products in the apple chain. Chile has a strong relative global competitive advantage with a constant trend for pears, while South Africa has a marginal global competitive advantage with a positive trend for this product.

In their apricot supply chains, both South Africa and Chile have a marginal relative competitive advantage for apricots in their primary form, with South Africa demonstrating a positive trend and Chile demonstrating a negative trend. Chile has a relative global competitive disadvantage for dried apricots with a negative trend, while South Africa, on the other hand, has a marginal global competitive advantage for this product with a constant trend. Chile has a strong relative global competitive advantage for nectarines and peaches with a negative trend, while South Africa has a marginal relative competitive advantage for these products with a negative trend.

South Africa has a global competitive disadvantage for dried plums in the plum supply chain and is on a positive trend. Chile, on the other hand, has a strong global competitive advantage for the whole plum chain with a negative trend for all products in the chain. It is interesting to note from Table 20 that the competitive trend for all of Chile's deciduous fruits is negative except for pears in their primary state, which have a constant trend. South Africa has, on the other hand, positive trends for most of the deciduous fruit products except for grape juice, nectarines and peaches, which have a negative trend, and dried apricots, which have a constant trend.

Table 20: Competitive advantage of the deciduous fruit industry

Chain	Product	South African RTA 2003	Trend 1995-2003	Chilean RTA 2003	Trend 1995-2003
Grape chain	Grapes	12.65	+	102.25	-
	Grape juice	2.34	-	8.41	-
	Raisins	10.89	+	23.72	-
Apple chain	Apples	8.90	+	29.48	-
	Apple juice	0.75	+	(0.0055)	-
	Concentrated apple juice	3.59	+	28.47	-
Pear chain	Pears	8.83	+	21.70	=
Apricot chain	Apricots	4.55	+	6.94	-
	Dried apricots	4.01	=	(0.26)	-
Nectarine & peach chain	Nectarines & peaches	1.29	-	26.66	-
Plum chain	Plums	15.23	+	70.23	-
	Dried plums (prunes)	(0.0079)	+	53.82	-

Source: Own calculations based on data from FAOSTAT 2005

Notes: "+"⇒ positive trend; "-"⇒ negative trend and "="⇒ constant trend

6.5 Factors affecting competitiveness of the South African deciduous fruit industry

Why is South African deciduous fruit only marginally competitive? It is important to discover the various underlying reasons for marginal competitiveness in the South African deciduous fruit supply chains. Does it relate to a lack of technological innovation, unproductive labour, high input cost, low quality or maybe government trade policy, etc.? The competitiveness of the industry depends on technological, socio-political and economic factors.

More important than the exact measure of competitiveness is to determine the reasons for a potential lack of competitiveness. In other words, it is not necessary to measure the competitiveness of the industry precisely and ignore to identify problems that reduce its current and future competitiveness. Therefore, this section attempts to identify and discuss factors that affect the competitiveness of the industry by using a framework of competitive advantage analysis proposed by Michael Porter (1990, 1998). This is because of the results in the preceding discussion, indicating that the South African deciduous fruit supply

chains are marginally competitive. The purpose of this section is, therefore, to find the reasons why the trends in the preceding section occur. Information for this section was gathered from the industry to give a better indication of what exactly is going on regarding the deciduous fruit industry's competitiveness. The factors discussed below are based mainly on the perceptions of industry leaders derived from information that was obtained from a questionnaire (see Appendix A) on issues influencing competitiveness.

The questionnaire was designed scientifically using Porter's methodology (Competitive Advantage of Nations, 1990, 1998) of determinants of competitive advantage to ensure that an accurate picture of the current state of affairs is reflected in terms of factors influencing the competitiveness of the South African deciduous fruit industry. The most important factors that were considered are: (a) factor conditions; (b) demand conditions; (c) related and supporting industries; (d) firm strategy, structure and rivalry; (e) government policies; and (f) the role of chance discussed in Section 5.2.1 of Chapter Five. According to Pitts and Lagnevik (1998) Porter 's model measures the competitive potential or competitive process, which is often of a qualitative nature, and this method looks at the availability of superior inputs or factors impacting on the competitiveness of the industry, which could be used to identify and improve competitiveness. It points out strengths and weaknesses; and critical strategic factors are identified to which industry has to pay special attention in order to develop and sustain a competitive advantage.

Because the population size was unknown, it was decided that the non-probability method should be used to determine the sample size. The questionnaires were distributed by either fax or e-mail, or they were completed during personal interviews. It is important to note that a total of thirty (sample size) questionnaires were sent to different organisations (exporters, producers and industry experts) in the industry and only eighteen were returned from respondents and were used in the analysis, which represents a response rate of 60 percent. While the results are not statistically meaningful, it is argued that they represent the views of the leading organisations in the industry.

6.5.1 Application of the Porter competitive advantage model

Each component of the Porter determinants of competitiveness is analysed separately and the main factors that impact on the competitiveness of the South African deciduous fruit

industry are discussed below.

(a) Factor conditions

According to Porter (1990 and 1998), the competitiveness of any industry can be affected by factor conditions such as skilled labour or infrastructure and the level of production costs that are necessary to compete in a given industry. Specialised key factors, such as skilled labour, capital and infrastructure, lead to competitiveness, since these factors are more difficult to duplicate. Van Berkum (2004) concurs that competitiveness of the industry embraces issues of resource endowment and the quality of these resources (labour, capital, human resources).

According to the National Department of Agriculture (NDA, 2001), recent studies have shown that factor conditions in South Africa generally constrain competitiveness in the agricultural and agro-processing sector. The most important factors in this regard are input prices, the productivity of the natural resource base, the cost and quality of unskilled labour, the cost of skilled labour, administration costs associated with hiring and managing labour, the quality of infrastructure, the cost of capital and the cost and availability of technology. Also in a recent analysis by Van Rooyen *et al*. (2000) 79 percent of South African agribusinesses interviewed (sample of 40) indicated that the level, cost and access to technology influences their competitiveness status. Is this the case for the deciduous fruit industry?

In Table 21 factor conditions, as determinants of the competitiveness of the South African deciduous fruit industry, are rated by organisations in the industry in terms of having a constraining, enhancing or neutral impact on competitiveness. The factor conditions that constrain the South African deciduous fruit industry's competitiveness mostly are the availability and quality of skilled labour; the cost and quality of unskilled labour; the availability and cost of capital and the cost of technology. The high cost of acquiring technology is a cause for concern. Joint ventures with research and development (R&D) and the technology industry need to be prioritised to allow the industry to maintain 'cutting edge' positions in a competitive world.

On the other hand, the factor condition that enhances the competitiveness of the South African deciduous fruit industry is the cost of skilled labour. Most of the organisations (61.11 percent) interviewed concur that the cost of skilled labour is affordable and this gives the industry a competitive advantage. From Table 21 it is clear that most of the organisations investigated indicate that other critical factor conditions that give the industry a competitive advantage are the availability and quality of infrastructure, and the availability and quality of technology. According to Van Rooyen *et al*. (2001) technology is viewed as one of the major factors determining the competitive position of the industry. Kirsten (1999) concurs that technology is an important factor in enhancing competitiveness. Management of quality of infrastructure and technology and the availability of capital will continue to be important to the industry's competitiveness. The South Africa deciduous fruit industry should, therefore, focus on global effectiveness with regard to research and technological development and use this as a catalyst to expand international competitiveness of the industry. Investment in existing technology and infrastructure will strengthen the industry's competitiveness.

Table 21: The impact of factor conditions on competitiveness

Factor conditions	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Labour:				
▪ Availability of skilled labour	66.67	27.78	5.56	100
▪ Cost of skilled labour	22.22	61.11	16.67	100
▪ Quality of skilled labour	50	33.33	16.67	100
▪ Availability of unskilled labour	11.11	88.89	0	100
▪ Cost of unskilled labour	61.11	27.78	11.11	100
▪ Quality of unskilled labour	88.89	0	11.11	100
Infrastructure				
• Availability	33.33	55.56	11.11	100
• Quality	22.22	72.22	5.56	100
Capital				
▪ Availability	61.11	22.22	16.67	100
▪ Cost	77.78	16.67	5.56	100
Technology				
• Availability	16.67	77.78	5.56	100
• Cost	50	44.44	5.56	100
• Quality	22.22	77.78	0	100

(b) Demand conditions

Demand conditions are a significant factor in helping generate competitiveness. The size, growth and composition of the domestic market play an important role in making the industry globally competitive. Inadequate information about market prices, consumer preferences and supply levels can make the industry uncompetitive. According to the National Department of Agriculture (NDA, 2001) the quality, availability and cost of market information seriously affects the competitiveness of the South African agricultural and agro-processing sector.

In Table 22 demand conditions, as determinants of the competitiveness of the South African deciduous fruit industry, are rated by organisations in the industry in terms of having a constraining, enhancing or neutral impact on the competitiveness of the industry. According to this table the demand condition with a constraining impact on the competitiveness of the industry is local market size (local market growth). Most of the organisations (77.78 percent) investigated indicated that growth of the local market is too slow for the investment in new technology that is necessary for the competitiveness of the industry. The organisations concur that this has a negative impact on the competitiveness of the industry. The quality of products, on the other hand, has an enhancing impact on the competitiveness of the industry. Almost all the organisations (94.44 percent) interviewed responded that the quality of the products the industry produces enhances the competitiveness of the industry. Despite the quality of the deciduous fruit the industry produces, there is, according to the National Agricultural Marketing Council (NAMC, 2000), evidence that South Africa's reputation as a reliable supplier of quality fresh fruit is deteriorating, mainly due to the fragmentation of supply and a tendency for exporters to push for higher export volumes to the detriment of quality. This will, in the long run, have a negative impact on the competitiveness of the industry if nothing is done to ensure that the industry strives for quality products. Market information also plays a pivotal role in enhancing the competitiveness of the industry. According to Table 22, 55.56 percent of the organisations investigated indicated that information flow from both customers and primary suppliers to their organisations is very poor, and this has a negative impact on their competitive status. The lack of timely and accurate 'fruit flow' information and the inaccuracy of some of the data of the Perishable Products Export Council Board (PECB) have a substantial impact on the South African deciduous fruit industry's competitiveness.

Table 22: The impact of demand conditions on competitiveness

Demand conditions	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Market information	55.56	27.78	16.67	100
Quality of products	0	94.44	5.56	100
Local market growth	77.78	16.67	5.56	100

(c) Related and supporting industries

A set of strong, related and supporting industries is important to the competitiveness of the industry. The presence of supplier industries that are globally competitive, such as input industries; financial institutions; research institutions, and suppliers of services, such as electricity, telecommunication and internet services, have an impact on the competitiveness of the deciduous fruit industry. The key to more efficient production and improved competitiveness lies in the availability of more competitive inputs and the application of improved production technology. Agricultural research, training and extension institutions are therefore critical for the competitiveness of the South African deciduous fruit industry. Financial institutions are also an important link in ensuring the competitiveness of the industry.

Van Rooyen *et al*. (2001) argue that research and technology development play an important role in improving the competitive status of the industry. In a recent analysis of agribusiness Van Rooyen *et al*. (2001) show that there is a direct relationship between competitiveness and R&D at an industry level. The link between R&D and competitiveness was also confirmed in a recent study by Esterhuizen *et al*. (2000) to determine the major factors influencing the competitiveness of agribusinesses further up in the chain. In this study, 50 percent of the 40 agribusinesses investigated indicated that the cost of knowledge (research) is a constraint to their competitiveness. This is not the case with regard to the deciduous fruit industry. Most of the organisations investigated indicated that their collaboration with scientific research institutions in their R&D activities is intensive and ongoing, and this reduces their cost of research and enhances their competitiveness.

In Table 23, related and supporting industries are rated by organisations according to their competitiveness to the South African deciduous fruit industry. Most of the supporting industries are rated by organisations in the industry as having contributed positively to the competitiveness of the industry. According to Table 23, the majority of organisations (77.78 percent) investigated concur that research institutions in South Africa enhance their competitiveness. Also the financial, agricultural suppliers (which are competitive and sustainable), and supporting industries, such as electricity suppliers, telecommunications and internet service providers, enhance the competitiveness of the industry.

Table 23: The impact of related and supporting industries on competitiveness

Related and supporting industries	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Financial institutions	38.89	61.11	0	100
Research institutions	5.56	77.78	16.67	100
Agricultural suppliers	16.67	72.22	11.11	100
Supporting industries				
▪ Electricity suppliers	33.33	66.67	0	100
▪ Telecommunications	33.33	61.11	5.56	100
▪ Internet service providers	16.67	83.33	0	100

(d) Firm strategy, structure and rivalry

In Table 24, the impact of firm strategy, structure and competitive rivalry, as determinants of the competitiveness of the South African deciduous fruit industry, are indicated. Managerial capabilities in organisations or firms, and by farmers, and the market power of buyers are very important factors in the competitive success of the deciduous fruit industry. Management is currently rated as highly competent by the organisations that were investigated in the deciduous fruit industry. Respectively, 61.11 percent and 77.78 percent of the organisations investigated indicated that managerial capabilities and the market power of buyers are very important factors enhancing the competitiveness of the industry. On the other hand, the threat of substitutes and threats of new entrants seem to have a constraining impact on the competitiveness of the industry. According to Table 24, 83.33 percent and 66.67 percent of the respondents concur that the threat of substitutes and the threat of new entrants respectively constrain the industry's competitiveness.

Domestic rivalry, on the other hand, enhances the competitiveness of the industry. Domestic rivalry in the deciduous fruit industry is very intense, and according to the

organisations (83.33 percent) investigated, this enhances the competitive advantage of the industry, since intense domestic rivalry creates pressure on them to improve and innovate. It pushes the organisations to improve quality and services and to create new products and processes, which are required for competitiveness. According to Porter (1990, 1998), there is a strong correlation between vigorous domestic rivalry and the creation and persistence of competitive advantage in any industry. Inadequate competition in the domestic market gives rise to inflexible organisations that are unresponsive to market requirements, making them become less competitive. Strong local competition is, therefore, important, and only in rare cases can an industry that is not competitive in its domestic market become globally competitive.

Table 24: The impact of firm strategy, structure and rivalry on competitiveness

Firm strategy, structure and rivalry	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Managerial capabilities	22.22	61.11	16.67	100
Market power of buyers	22.22	77.78	0	100
Threat of substitutes	83.33	16.67	0	100
Threat of new entrants	66.67	27.78	5.56	100
Domestic rivalry	11.11	83.33	5.56	100

(e) Government attitude and policy

Government plays an important role, if not the most important role, in international competitiveness. It can influence the competitiveness of the industry either positively or negatively, depending on its policies, programmes and operational system. The government's role in enhancing the competitiveness of the industry is to ensure the proper working of the market by its policies. Its role should be to create a friendly environment for the industry to prosper in. However, it is important to realise that government cannot make each and every farm or organisation in the industry competitive. Thus, while individual farmers or organisations are responsible for their own production and marketing decisions and the efficiency and cost-effectiveness of their own operations, government is responsible for creating the right environment in which they can operate effectively. Government can, therefore, enhance the competitiveness of the industry by ensuring the proper working of the market.

A stable and predictable macro economic environment, in particular a stable exchange rate policy, is seen as a necessary condition in order to facilitate the development of a sustainable competitive industry. Macro-economic conditions, sometimes the result of government policies, may put an industry in an unfavourable competitive position. Having appropriate structural policies is also important as these policies facilitate adjustment and capture the scale economies that are needed to enhance competitiveness along the chain. There is a perception in certain industries of the South African agricultural fraternity that some government policies and a lack of effective implementation of government programmes constrain the competitiveness of agriculture and the agro-food industry (NDA, 2001). In Table 25, the impact of government through government policy and attitude as determinants of the competitiveness of the South African deciduous fruit industry are rated according to their constraining, enhancing, or neutral effect on competitiveness. According to this table, 61.11 percent of the organisations investigated indicated that both trade and macro economic policies have an enhancing impact on the competitiveness of the deciduous fruit industry, and 94.44 percent of the organisations investigated concur that competition law in South Africa enhances the competitiveness of the industry. Land reform policy, labour policy, fiscal policy (tax system) and BEE policy, on the other hand, have been pointed out by the organisations as having a negative impact on the competitiveness of the industry. According to Table 25, 77.78 percent of the organisations investigated indicated that current land reform policy influences their competitiveness (much criticism and frustration was expressed about the lengthy land reform process), 88.89 percent indicated that labour policy constrains the industry's competitiveness, 77.78 percent of organisations concur that the current tax system hinders business investment and they indicated that this has a negative impact on the competitiveness of the industry, whereas 66.67 percent of organisations emphasised that BEE policy impacts negatively on their competitiveness. In aggregate terms, land reform policy, labour policy, fiscal policy and BEE policy have a negative impact on the competitiveness of the industry.

It is important for the South African deciduous fruit industry to realise that it will probably take years to level the 'playing field', and the industry can only accomplish competitiveness by focusing on local policies that intend to reduce production costs and ensure the proper working of the market.

Table 25: The impact of government attitude and policy on competitiveness

Government	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Trade policy	27.78	61.11	11.11	100
Land reform policy	77.78	11.11	11.11	100
Labour policy	88.89	0	11.11	100
Fiscal policy ▪ Tax system	77.78	16.67	5.56	100
Environmental standards	33.33	55.56	11.11	100
Macro economic policy	22.22	61.11	16.67	100
Competition law	0	94.44	5.56	100
BEE policy	66.67	27.78	5.56	100

(f) Chance factors

Agriculture is per definition the sector that is confronted by risk in the form of climatic variations, pests, diseases and price risks as well as natural disasters, such as droughts and floods, and these factors are referred to as chance factors and can influence the competitiveness of the industry. Chance factors are events that have little to do with circumstances in the nation and are often largely outside the power of industry, and often the national government, to influence.

According to the National Department of Agriculture (NDA, 2001) the high incidence of HIV/AIDS, crime, high and fluctuating real interest rates, natural disasters, and unstable prices caused by the unpredictable socio-political, economic and natural climates are the most important factors that increase costs and constrain the competitiveness of South African agriculture, including both the agro-food and fibre complex.

In Table 26, the impact of factors that are difficult for the deciduous fruit industry to control and also the stability of the economic environment on the competitiveness of the industry are indicated. Economic stability (current exchange rate), HIV/AIDS, political stability and crime are chance factors that have a constraining impact on the competitiveness of the deciduous fruit industry. Most of the organisations (83.33 percent) investigated indicated that the legal and political changes over the past five years undermined their planning capacity and this negatively influenced their competitiveness. Almost all the organisations (94.44 percent) indicated that the current high level of crime in South Africa imposes costs to their organisations, and this constrains the competitiveness of the industry. According to

Burger *et al*. (2001) South Africa is generally regarded as a country where crime is rampant and where society is experiencing an ever-increasing crime wave. The high incidence of HIV/AIDS also impact negatively on the competitiveness of the industry, 66.67 percent of the organisations investigated indicated that the related social problems such as high rate of HIV/AIDS has a constraining impact on the competitiveness of the industry. Crime and AIDS are externally manipulated factors over which the industry has relatively little control, therefore government has to play an important role in making sure that it manages these issues. Government efforts to manage the HIV/AIDS pandemic, to combat crime, and to ensure macroeconomic stability will reduce the cost associated with chance factors, and this will enhance the competitiveness of the South African deciduous fruit industry. The industry also has to reduce its reliance on the exchange rate to improve its competitiveness.

Table 26: The impact of chance factors on competitiveness

Chance	Constrain (% of respondents)	Enhance (% of respondents)	Neutral (% of respondents)	Total (% of respondents)
Economic stability (Current exchange rate)	88.89	11.11	0	100
HIV/AIDS	66.67	16.67	16.67	100
Political stability	83.33	16.67	0	100
Crime	94.44	0	5.56	100

6.6 Conclusion

This chapter determined the competitive status of South Africa's deciduous fruit supply chains relative to those of Chile using the RCA#, NX_i and the RTA indexes. It is important to note at this point that comparative and competitive advantage analyses in this study used trade data, implying that the results do not necessarily mean that a supply chain of a specific deciduous fruit has a competitive advantage or disadvantage from a local point of view. Various factors must be taken into consideration before it can be concluded that the supply chain of the specific deciduous fruit has a competitive advantage or disadvantage from a local point of view. The analyses in this chapter, therefore, only indicate the comparative advantage and competitiveness in world trade.

The results of the analyses clearly indicate that South Africa's deciduous fruit supply chains are generally marginally competitive since most of the RCA# and RTA values are less than 10 and are mostly less than those of Chile. Apple juice and dried apricots are the only products in the South African deciduous fruit supply chains with a higher revealed comparative advantage and relative competitive advantage than Chile.

Esterhuizen and Van Rooyen (2001) argue that there is a decrease in global competitiveness when moving from primary to processed products in the selected agro-industry supply chains they studied. This is also the case with most of the deciduous fruit supply chains. All deciduous fruit supply chains show that there is a decrease in global competitiveness when moving from primary to processed products, except for the apple and apricot chains, which show an increase in global competitiveness when moving from primary to processed products. This implies that value adding opportunities are still lacking in the South African deciduous fruit industry. It is interesting to realise from the chapter that the competitive trend for all of Chile's deciduous fruits is negative except for pears in their primary state, which have a constant trend. South Africa has, on the other hand, positive trends for most of the deciduous fruit products except for grape juice, nectarines and peaches, which have negative trends and dried apricots, which have constant trends.

Because of the above results, the study attempts to discover the various underlying reasons for the marginal competitiveness of the South African deciduous fruit industry. This was done by using a framework of competitive advantage analysis proposed by Porter (1990, 1998). The most important factors that were indicated by the organisations investigated to have an impact on the competitiveness of the industry were availability of skilled labour; cost and quality of unskilled labour; availability and quality of capital; cost of technology; local market growth; lack of timely and accurate information and the inaccuracy of some of the data of the Perishable Products Export Council Board (PPECB); threats of substitutes; land reform policy; labour legislation; current exchange rate (current strength of rand); BEE policy; continued agricultural subsidies received by growers in countries competing with South Africa in the global markets; and high incidence of HIV/AIDS and crime. All the participants in the South African deciduous fruit industry have to pay special attention to the above-mentioned critical factors that impact negatively on the competitiveness of the industry, in order to develop and sustain competitive advantage as successfully as possible in years to come.

CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

7.0 Introduction

The objective of the analyses undertaken in Chapter Six was to find an answer to the research question identified in Chapter One. The following research question was raised: What is the competitive advantage of the South African deciduous fruit supply chains relative to those of Chile? The objectives of this chapter are, therefore, first to summarise the most important findings of the study by answering the research question posed in Chapter One with evidence from Chapter Six; second, to give some strategies that the participants in the deciduous fruit industry supply chain may consider adopting to promote competitiveness; and lastly, to give recommendations for further research.

7.1 Revisiting the research question

The following research question was raised in Chapter One: What is the competitive advantage of the South African deciduous fruit supply chains relative to those of Chile? From Chapter Six it is evident that the South African deciduous fruit industry is generally marginal positive as far as global competitiveness is concerned. The results of the RCA#, NX_i and RTA index analyses in Chapter Six show that the South African deciduous fruit supply chains are generally marginally competitive. The results of the RCA# index analysis of the South African grape supply chain indicates that grapes in their primary form (fresh grapes) have a strong revealed comparative advantage, whereas all value added grape products struggle with a marginal revealed comparative advantage, except for raisins in 1997, 1999 and 2003 when this product experienced a strong revealed comparative advantage. Pears, apples and all their value-added products have a marginal revealed comparative advantage, except for apple juice, which experienced a revealed comparative disadvantage in 2003. All products in the stone fruits supply chain experience marginal comparative advantage, except for dried plums, which experience a revealed comparative disadvantage. Plums in their primary form exhibit a strong revealed comparative advantage for the whole period, except in 1995 and 1996 when this product was experiencing a marginal revealed comparative advantage.

The Relative Revealed Comparative Trade Advantage (RTA) index analysis shows that most of the products in the grape chain have a marginal relative global competitive advantage, except for raisins, which experienced strong relative global competitive advantage in 1997, 1999 and 2003. Grapes in their primary form have a strong global competitive advantage. All pome fruits (apples and pears) and their value-added products in the pome fruit supply chain experience a marginal global competitive advantage. The RTA analysis also shows that most of the products in the stone fruit (apricots, nectarines and peaches and plums) supply chain experience relative marginal global competitive advantage, except for dried plums in the plum chain, which experienced a relative global competitive disadvantage in 1997 and 2003.

Chile is South Africa's biggest competitor in the deciduous fruit markets, mainly due to the fact that this country enjoys the same seasonal advantage regarding access to South Africa's most important export markets, namely, the EU, UK, US and Far East. Comparing Chile's deciduous fruit supply chains competitiveness with South Africa's, Chile has a strong revealed comparative advantage as well as a relatively high competitive advantage in almost all of the deciduous fruit supply chains, while South Africa is struggling with a marginal revealed comparative advantage and a marginal relative competitive advantage. Chile has a strong revealed comparative advantage and a relatively higher global competitive advantage in fresh grapes, grape juice, raisins, apples, concentrated apple juice, pears, apricots, nectarines and peaches, plums and dry plums than South Africa. South Africa, on the other hand, has only a relatively better global competitive advantage in apple juice and dried apricots than Chile. Despite South Africa's marginal competitiveness, almost all deciduous fruit supply chains are experiencing an upward competitiveness, and this is not the case for Chile.

It is interesting to realise from Chapter Six that South Africa has a marginal global competitive advantage for all deciduous fruits, except for dried plums and apple juice, and all, except grape juice, dried apricots and nectarines and peaches, are on a positive trend. Chile, on the other hand, has a higher global relative competitive advantage for almost all deciduous fruits, except for apple juice and dried apricots, and all, except for pears, are on a negative trend. Chile has a higher global relative competitive advantage over South Africa because it achieved its competitiveness by focusing on comparative advantage combined with foreign investment or partnerships, subsidies, tax exemptions, duty

drawback schemes, publicly provided market research and public initiatives fostering scientific expertise. Chile's government played and still plays an important and direct role in supporting its fruit sector.

7.2 Conclusion

In conclusion, the study shows that Chile produces more grapes, apples, plums, peaches and nectarines than South Africa. It produces 25 percent of the total southern hemisphere deciduous fruits whereas South Africa produces only 18 percent of the total southern hemisphere deciduous fruits. Chile has a number of advantages that benefit the production of deciduous fruits. Production is counter-seasonal to the large northern hemisphere markets; this lessens competition to the Chilean deciduous fruit industry from its competitors. The country has superior soil and water resources and it is isolated physically, providing excellent natural protection from pests and diseases. It has an appropriate and stable macroeconomic environment, a modern productive infrastructure, and a well-developed transportation infrastructure which give the Chilean deciduous fruit industry a comparative advantage.

The analyses in Chapter Six shows that almost all of the deciduous fruit supply chains in South Africa are marginally competitive and have a relative competitive advantage. The analyses further show that the South African deciduous fruit industry is struggling with a marginal global comparative and competitive advantage in terms of its value-added products. It is clear that there is still a lack of comparative as well as competitive advantage on the value-added level. Despite difficult local conditions, the deciduous fruit industry responded successfully to the great challenges of the major economic deregulations since 1994 and succeeded in operating more competitively for the last nine years, as shown by the positive trend in competitiveness in Chapter Six. Indications are that this trend will persist. Chile, known to be one of South Africa's biggest competitors in the deciduous fruit industry, has a higher global comparative advantage as well as a better relative competitive advantage than South Africa. It is interesting to realise that the competitive trend for all of Chile's deciduous fruit is negative, except for pears in their primary state, which have a constant trend. South Africa has, on the other hand, positive trends for most of the deciduous fruit products, except for grape juice, nectarines and peaches, which have negative trends, and dried apricots, which have constant trends.

Another important observation made from the analyses is that value-adding opportunities are still limited or constrained in the South African deciduous fruit industry, since the competitiveness of most of the deciduous fruit supply chains decreases from primary to processed products, except for the apple and apricot chains, which show an increase in global competitiveness when moving from primary to processed products. One possible explanation for this could be the high rates of return recorded for farm level applications of technology for most deciduous fruit primary commodities.

On the basis of the findings in Chapter Six , which show that the South African deciduous fruit industry is struggling with marginal global comparative and competitive advantage, an attempt was made to identify and discuss some of the factors that affect the competitiveness of the industry using a framework of competitive advantage analysis proposed by Porter (1990, 1998). More important than the exact measure of competitiveness was to determine the reasons for a potential lack of competitiveness of the industry. The most important factors that were found to have a negative impact on the competitiveness of the South African deciduous fruit industry were availability of skilled labour; cost and quality of unskilled labour; availability and quality of capital; cost of technology; local market growth; threat of substitutes; land reform policy; labour legislation; current exchange rate (current strength of rand); BEE policy; continued agricultural subsidies received by growers in countries competing with South Africa in the global markets; and high incidence of HIV/AIDS and crime. The lack of timely and accurate 'fruit flow' information and the inaccuracy of some of the data of the PPECB also have a substantial impact on the South African deciduous fruit industry's competitiveness. Therefore, much still needs to be done to ensure that the industry becomes competitive in the international arena.

7.3 Recommendations to improve competitiveness

The conclusions above clearly indicate that there is a need for competitive strategies to be adopted by all the participants in the supply chains in order to improve the competitiveness of the South African deciduous fruit industry, particularly when one looks at the changes that have occurred in the industry in the past decade. Supply chain management can be viewed as one of the most important ways of improving the competitive advantage of the industry. Value will be lost if the supply chain is not functioning in an effective and efficient

manner. Worley (1996) emphasises that in future supply chains will compete among themselves, and if only certain elements in the supply chain perform efficiently, then the full potential for value adding will not be realised. Therefore, it is no longer good enough for farmers to compete at farm-gate level, while value-adding activities (processes) are not globally competitive. Value adding should become a focal area for investment, and research and technology development will therefore have to focus on downstream consumer requirements, both locally and internationally. However, this does not mean that primary producer practices should be ignored.

The South African deciduous fruit industry will need to ensure that it consists of a supply chain that provides for a faster, more co-ordinated system of product movement, processing, and delivery, which will continue to lower costs while maintaining product quality, freshness and safety. This is what a rapidly urbanising, higher income, and more demanding world population want. Improved co-ordination along the supply chain has the potential to overcome many of the inherent weaknesses associated with primary agriculture, in particular, the lack of capital for investment, lack of information and know-how of modern technologies, and greater access to high value-added markets. Therefore, in order to enhance and sustain the long-term competitiveness of the South African deciduous fruit industry, it is crucial to ensure better co-ordination of all stakeholders (links) in the supply chain, supported by the appropriate macro-economic and structural policies.

Issues surrounding food quality and safety are becoming increasingly important in the fresh produce industry due to the rising income and education levels of consumers in most advanced industrialised countries. Consumers worldwide have become accustomed to high standards of quality and uniformity of produce. According to Hughes (2004), consumers are more knowledgeable as a result of higher training, education and better access to information, and this refines the consumers' perspective on diet and health. With consumers' concern about food quality and safety, supply chains can be viewed as an important means of improving the competitive advantage of the deciduous fruit industry. Hallat (2005) argues that quality food production can be viewed as a means of bypassing the competitive margin base 'race to the bottom'. As South Africa has a marginal competitive advantage for most of its value-added deciduous fruits products, emphasis must, therefore, be put on this area. Ensuring quality deciduous fruit along the supply chain, through an integrated concept, to ensure safety at the source and from 'farm-to fork'

can thus be viewed as a means to improve the global competitiveness of the South African deciduous fruit industry.

Innovation can be regarded as one of the possible strategies that can improve the competitiveness of the industry. According to Porter (1990), innovation includes improvements in technology, better ways of doing things and new ideas for approaching markets. Van Berkum and Van Meijl (2000) concur that innovation is an important driver of international trade and therefore an important factor determining the competitiveness of an industry. To remain competitive, the industry requires innovation, the integration of new developments into business operations, and the ability to adapt business strategies to changing circumstances. Innovations can shift the competitive advantage when rivals either fail to perceive the new way of competing or are unable to respond. Innovation, aggressive research, and technology can therefore lead to substantial improvement in the competitiveness of the South African deciduous fruit industry.

In Broens' *et al*. (2000) study on the cold fruit supply chains between South Africa and the Netherlands, various infrastructure capacity problems were identified, such as insufficient cold storage facilities, not enough refrigerated trucks suitable for fruit transport, and bottlenecks at the fruit terminals. The 2001 TISA National Supply Chain Strategy study also considered physical and technology infrastructure as one of the essential elements required by an industry for improving competitive advantage. In terms of exports, the TISA study identified, among others, operational inefficiencies at ports, high inland transportation costs and rail facilities lacking at ports as drivers of increased supply chain costs and lead times that impair export competitiveness. Therefore, improving the South African deciduous fruit industry's competitiveness requires, among others, more efficient port operations and other infrastructural efficiency improvements. Better planning of logistics infrastructure usage will result in a reduction of bottlenecks and delays and a faster flow of deciduous fruits through the supply chain. This will in turn result in less produce quality deterioration and better prices realised by producers and exporters. A state-of-the-art and efficient logistics and infrastructure system will increase the competitiveness of the industry. In addition, better infrastructure utilisation will result in lower transaction costs and therefore increased competitiveness of the deciduous fruit industry. Any improvement in the international competitiveness of the industry will play an important role in enhancing economic growth.

The South African deciduous fruit industry needs to establish, maintain and promote sustainable, as well as environmentally- and human-friendly, plant improvement programmes and primary production practices; picking and field to packhouse transport practices; packhouse practices; post-harvest treatments; and coldroom management and cold chain management practices that ensure improved product quality in order for it to become competitive. By not achieving this, the industry will lose market share due to inconsistent product quality, and this will affect the competitiveness of the industry.

The Fruit Industry Plan (FIP, 2006) states that since deregulation, it has taken too long for the industry to address known information issues that are costing the industry dearly. Information in the deciduous fruit industry is unreliable, incomplete, late, inaccessible and inappropriate. For the industry to become internationally competitive, all stakeholders need to easily access relevant, accurate, reliable, up-to-date information in appropriate formats. The industry requires a large amount of reliable and accurate information to undertake its farming activities, plan marketing, renew cultivars, plan farm economics, participate in empowerment activities, fulfil statutory and standards requirements and grow the industry. Good information is an industry-critical success factor and by not achieving this the industry will waste its effort by continuing in a fragmented manner, and it will be unlikely to improve competitiveness.

The South African deciduous fruit industry is still confronted by a huge number of factors hampering marketing and putting pressure on competitiveness. These include uncontrollable and controllable factors. Uncontrollable factors include the volatility of the South African rand against major international currencies. The controllable factors over which the deciduous fruit industry can exert some pressure include high input costs. Good marketing and distribution services both locally and globally can therefore be considered a strategy to improve competitiveness, because these can have a positive effect on the competitiveness of the South African deciduous fruit industry. Therefore, the industry needs to identify critical points in the supply chain where transaction costs can be reduced in order to improve its competitiveness, taking into account available and needed logistical infrastructure.

All of the above-mentioned strategies cannot be achieved without the help of the government. Therefore, government has to play a crucial role in ensuring that these strategies are achieved for the industry to improve its competitive advantage. It should provide institutional support in areas of credit and research and development (R&D) for the deciduous fruit industry to become competitive in international markets. In order to ensure that opportunities exist for the industry to develop and maintain and improve competitiveness, the government has to create the right investment climate. The government's role in enhancing the competitiveness of the industry should be to ensure the proper working of the market. Therefore, the strategic need of the deciduous fruit industry is for a more 'agriculture-friendly' government. This implies, among others, better alignment to the problems of the industry, a greater clarity of communication, and better overall communication with government.

7.4 Recommendations for further research

During this study further research areas were identified, and these include:

- An analysis of the South African secondary deciduous fruit industry needs to be undertaken to establish why South Africa experiences a marginal competitive advantage in value-added products.
- An analysis of the South African deciduous fruit industry supply chain needs to be undertaken. This kind of study must analyse the whole supply chain from the farmer to consumer. This will help to give an indication of where the weak links in the supply chain lie. Recommendations on how the weak links in the supply chain can be overcome must then be made.
- The demand conditions of the deciduous fruit industry in South Africa also need to be analysed. In this study consumer needs must be analysed. According to Porter (1990), demand conditions are an important factor to help produce competitiveness. Therefore, this kind of study is imperative because demand conditions are an important determining factor of relative competitive advantage. This study must look at what consumers want in deciduous fruit products and what processors can do to fulfil their needs.

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APPENDIX A: QUESTIONNAIRE

Dear Sir/Madam

Project: Global Competitiveness of the Deciduous Industries: South Africa Versus Chile.

We are investigating the relative competitiveness of the deciduous fruit industry in South Africa. The primary objective of this project is to investigate the supply chain competitiveness of the deciduous fruit industry in an effort to improve efficiency so that opportunities that exist can be exploited. An overview of the industry is of great importance to give a better idea of what is currently the situation. The analysis will be done for all the different deciduous fruit products produced by the industry in South Africa.

Your organisation has been selected to provide vital information to assess competitiveness conditions in the deciduous fruit industry of South Africa. Your expert opinion is therefore essential in bringing light to competitiveness issues that are important for the country and the industry in which your organisation operates.

Included is a questionnaire to help us with the collection of information we need to conduct this study. The questionnaire is designed scientifically according to Porter's method (Competitive Advantage of Nations, 1990, 1998) and will ensure that an accurate picture of the current state of affairs is reflected in terms of factors influencing the competitiveness of the industry.

The questionnaire will only take about 10 minutes to complete. Most of the questions in this questionnaire ask you to check a box (using an X) according to your opinion. The questions are of the following format, for example:

Competition in the local market is:

Very limited	1	2	3	Very intense

Crossing 1 means you largely agree with the left-hand side

Crossing 2 means your opinion is indifferent between the two answers

Crossing 3 means you largely agree with the right-hand side

Note: Please check only one number per question

We humbly ask you to complete this questionnaire as accurately as possible. **We would sincerely appreciate it if you can e-mail/fax it back to us**. Please be sure that individual company information will be kept *strictly confidential* and will only be used as a group and not on an individual basis.

If there are any uncertainties please do not hesitate to contact Tebogo Edwin Mashabela (Tel: 021 808 5207) (Fax: 021 808 5210) or Prof Nick Vink (021 808 4899).

We thank you for taking the time to complete this questionnaire and appreciate that it represents a major contribution on your part.

Regards,
Mr. Tebogo Mashabela
FOR Prof. Nick Vink.

A. General Information

Complete the following details.

Organisation name _____

Address: P o Box _____

Town _____

Code _____

Complete the following contact details.

Contact person: _____

Position in the organisation: _____

Job title: _____

Tel: _____

e-mail:_____

B. Executive Survey

1) Skilled labour is:

Difficult to obtain by your company	1	2	3	Easy to obtain by your company

2) Skilled labour in South Africa is:

Not of a very high quality	1	2	3	Among the best in the world

3) Skilled labour in South Africa is:

Too costly	1	2	3	Affordable

4) Unskilled labour is:

Difficult to obtain by your company	1	2	3	Easy to obtain by your company

5) Unskilled labour in South Africa is:

Not of a very high quality	1	2	3	Used productively by your company

6) Unskilled labour in South Africa is:

Too costly	1	2	3	Affordable

7) The general infrastructure used by your company in South Africa is:

Poorly developed and inefficient	1	2	3	Among the best in the world

8) The cost of using the infrastructure in South Africa is:

Extremely high	1	2	3	Affordable

9) The quality of technology for your industry in South Africa:

Generally lags behind most other countries	1	2	3	Is among the world leaders

10) Quality technology for your industry in South Africa is:

Difficult to obtain	1	2	3	Easy to obtain

11) The cost of quality technology in South Africa is:

Extremely high	1	2	3	Affordable

12) Obtaining credit for your company in South Africa is:

Extremely difficult	1	2	3	Easy

13) The cost of financing in South Africa is:

Extremely high	1	2	3	Affordable

14) Financial institutions in South Africa are generally a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

15) Scientific research institutions for your industry in South Africa are:

Non-existent	1	2	3	The best in their fields

16) Your company's collaboration with scientific research institutions in their R&D activities are:

Non-existent	1	2	3	Intensive and ongoing

17) Research institutions in South Africa are generally a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company'ss competitive success

18) Electricity suppliers in South Africa are a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

19) Telecommunication firms in South Africa are a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

20) Internet service providers in South Africa are a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

21) Specialised information technology services are:

Not available	1	2	3	Available from world-class local institutions

22) Is the growth in the local market:

Too slow for investment in new technology	1	2	3	Fast enough for investment in new technology

23) Your opinion on the bargaining power of your company's customers:

Have no power at all	1	2	3	Very powerful

24) The flow of information from the customers to your company is:

Very poor	1	2	3	Very good

25) Competition in the local market is:

Very limited	1	2	3	Very intense

26) Entry of new competitors:

Almost never occurs in the local market	1	2	3	Is common in the local market

27) Substitutes of your company's product or services range is:

No problem	1	2	3	A big threat

28) Local suppliers of your company's primary inputs are:

Largely non-existing	1	2	3	Numerous and include the most important materials, components, equipment and services

29) The quality of local suppliers of your company's primary inputs:

Local suppliers are inefficient and have little technological capability	1	2	3	Local suppliers are internationally competitive and assist in new product and process development

30) The sustainability of local suppliers of your company's primary inputs:

Huge problem	1	2	3	No problem at all

31) The information flow from primary suppliers to your company is:

Very poor	1	2	3	Very good

32) The tax system:

Hinders business investment and risk-taking	1	2	3	Promotes business investment and risk-taking

33) Have legal or political changes over the past five years undermined your company's capacity for planning:

Have severely undermined planning capacity	1	2	3	Have had no effect

34) Complying with environmental standards in South Africa:

Hurts competitiveness	1	2	3	Helps long-term competitiveness by prompting companies to improve products and processes

35) South Africa's trade policy is a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

36) South Africa's land reform policy is a/an:

Constraint to your company's competitive success	1	2	3	Opportunity to increase your company's competitive success

37) South Africa's labour policy is a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

38) South Africa's macro economic policy is a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

39) South Africa's competition law is a/an:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

40) South Africa's BEE policy is a/an:

Constraint to your company's competitive success	1	2	3	An opportunity to increase your company's competitive success

41) Crime in South Africa:

Imposes significant costs on your company	1	2	3	Does not impose significant costs on your business

42) Aids in South Africa:

Imposes significant costs on your company	1	2	3	Does not impose significant costs on your business

43) Is the current exchange rate a:

Constraint to your company's competitive success	1	2	3	Enhancement to your company's competitive success

44) The competitive advantage of your company is due to:

Low costs based on low wages or natural resources availability	1	2	3	Unique products, services and processes

45) The competitive advantage of your company is due to the selling of:

Relatively cheap products of inferior quality	1	2	3	Affordable, high quality products

46) Your company's approach to human resources is:

To invest little in training and employee development	1	2	3	To invest heavily to attract, train and retain staff

47) Your company:

Does not spend money on R&D	1	2	3	Spends heavily on R&D relative to international peers

48) Please name the five most important factors that impact negatively on your organisation's ability to compete?

1. _____

2. _____

3. _____

4. _____

5. _____

49) Please name the five most important factors that give your organisation a competitive advantage over the competition?

1. _____

2. _____

3. _____

4. _____

5. _____

Thank you for your time

APPENDIX B: DATA USED IN CHAPTER SIX TO MEASURE THE COMPARATIVE ADVANTAGE AND COMPETITIVENESS OF DECIDUOUS FRUIT SUPPLY CHAINS

Appendix B.1 World and South African total merchandise exports and imports

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total world merchandise exports	5,111,411,870	5,342,692,610	5,540,492,390	5,468,369,420	5,669,242,540	6,380,843,050	6,130,013,160	6,436,833,210	7,465,838,040
Total world merchandise imports	5,155,407,570	5,393,792,380	5,577,934,310	5,528,389,420	5,760,745,280	6,539,390,000	6,304,380,130	6,567,275,000	7,646,613,900
Total South African merchandise exports	28,331,500	29,496,700	28,221,500	28,497,500	26,713,300	29,983,000	28,996,700	29,723,000	36,482,000
Total South African merchandise imports	26,837,900	27,035,800	31,242,600	26,786,200	24,079,500	29,695,000	28,040,300	29,267,000	41,084,000

Source: FAOSTAT, 2005

Appendix B.2 World grape products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Grapes export value	1,952,372	2,070,677	2,272,186	2,195,065	2,299,087	2,503,104	2,493,443	2,693,725	3,134,710
Grapes import value	2,252,266	2,510,951	2,665,367	2,648,892	2,772,811	2,849,658	2,898,343	3,067,838	3,686,626
Grape juice export value	406,460	410,647	448,463	408,276	419,512	352,496	324,619	340,033	406,269
Grape juice import value	383,318	448,419	458,279	396,113	433,686	384,572	332,311	344,453	411,860
Raisins export value	678,620	724,797	704,380	707,620	719,746	672,571	558,043	577,380	663,924
Raisins import value	746,204	773,731	778,930	749,579	767,217	707,020	599,277	601,849	701,675

Source: FAOSTAT, 2005

Appendix B.3 South African grape products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Grapes export value	116,117	91,129	121,401	141,795	175,324	161,320	132,766	127,383	183,952
Grapes import value	479	308	620	725	114	191	84	563	917
Grape juice export value	13,558	8,009	7,651	10,440	11,088	12,676	9,025	9,437	8,881
Grape juice import value	5,493	11,469	10,510	3,506	254	419	746	382	4,859
Raisins export value	23,582	26,954	35,963	21,060	35,146	21,774	20,752	25,174	33,868
Raisins import value	0	0	187	59	171	920	340	106	193

Source: FAOSTAT, 2005

Appendix B.4 World apple products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apples export value	3,020,498	3,264,397	2,811,223	2,638,691	2,611,352	2,282,795	2,422,260	2,882,754	3,415,133
Apples import value	3,223,164	3,491,239	2,961,559	2,822,614	2,837,405	2,514,888	2,765,358	3,070,652	3,818,524
Apple juice export value	370,902	469,752	406,496	361,577	397,999	457,555	467,291	528,731	664,262
Apple juice import value	534,841	590,553	498,385	435,315	460,575	516,183	446,798	384,568	568,302
Concentrated apple juice export value	758,033	770,851	665,677	516,226	588,837	690,668	520,284	440,138	587,154
Concentrated apple juice import value	659,010	774,371	680,299	495,171	590,060	680,563	589,566	557,114	729,540

Source: FAOSTAT, 2005

Appendix B.5 South African apple products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apples export value	115,757	92,669	101,719	125,162	97,924	67,402	70,529	83,597	143,045
Apples import value	0	1	0	1,796	0	0	0	2	47
Apple juice export value	17,677	25,255	24,408	10,801	23,365	24,609	18,527	7,500	2,630
Apple juice import value	3,026	3,099	435	4,578	4,224	4,242	1,099	2,000	173
Concentrated apple juice export value	0	0	0	0	0	0	0	0	12,838
Concentrated apple juice import value	0	0	0	0	0	0	0	0	3,768

Source: FAOSTAT, 2005

Appendix B.6 World pears export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pears export value	959,163	1,013,433	1,069,767	997,385	995,142	892,601	929,100	996,747	1,165,537
Pears import value	1,083,820	1,112,365	1,132,763	1,086,386	1,092,992	1,011,980	1,043,070	1,140,963	1,322,147

Source: FAOSTAT, 2005

Appendix B.7 South African pears export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pears export value	37,458	32,925	55,825	43,113	47,709	34,439	26,364	35,464	48,455
Pears import value	0	0	0	25	0	0	0	0	0

Source: FAOSTAT, 2005

Appendix B.8 World apricot products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apricots export value	180,762	187,719	176,115	180,190	164,605	154,406	164,720	178,657	195,522
Apricots import value	188,670	194,162	186,370	188,316	170,246	167,409	175,320	176,988	207,153
Dried apricots export value	126,971	133,982	144,549	156,054	166,418	148,062	128,039	153,491	194,780
Dried apricots import value	129,603	148,401	158,964	171,187	167,148	161,766	131,893	160,675	196,291

Source: FAOSTAT, 2005

Appendix B.9 South African apricot products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apricots export value	1,671	715	4,663	3,567	4,748	4,763	3,552	3,294	4,330
Apricots import value	83	0	13	0	10	0	14	16	68
Dried apricots export value	4,300	2,899	2,964	3,352	3,406	2,639	3,625	3,356	4,175
Dried apricots import value	120	174	386	323	92	397	183	160	477

Source: FAOSTAT, 2005

Appendix B.10 World nectarines and peaches export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peaches & nectarines export value	888,299	880,759	933,835	960,376	816,219	827,302	944,811	967,285	1,290,918
Peaches & nectarines import value	928,701	936,092	983,102	1,002,305	929,266	892,746	1,003,424	988,049	1,358,141

Source: FAOSTAT, 2005

Appendix B.11 South African nectarines and peaches export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peaches & nectarines export value	1,493	4,098	7,449	6,785	7,648	6,637	5,952	6,517	8,146
Peaches & nectarines import value	117	37	2	52	27	24	2	27	34

Source: FAOSTAT, 2005

Appendix B.12 World plum products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Plum products export value	277,567	312,378	337,335	314,835	327,089	291,355	343,967	346,830	426,987
Plum products import value	345,460	379,984	408,073	380,517	383,799	335,831	398,503	396,390	505,885
Dried plum products export value	268,061	230,352	232,252	233,705	240,153	251,391	268,837	268,109	283,288
Dried plum products import value	232,983	222,868	225,899	225,206	229,490	236,294	241,686	248,678	280,110

Source: FAOSTAT, 2005

Appendix B.13 South African plum products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Plum products export value	14,216	15,578	23,495	20,461	32,753	18,794	19,729	19,077	29,723
Plum products import value	95	125	0	64	57	143	58	48	31
Dried plum products export value	324	495	123	106	207	383	183	164	102
Dried plum products import value	250	107	141	67	147	85	79	94	123

Source: FAOSTAT, 2005

Appendix B.14 World and Chile total merchandise exports and imports:

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total world merchandise exports	5,111,411,870	5,342,692,610	5,540,492,390	5,468,369,420	5,669,242,540	6,380,843,050	6,130,013,160	6,436,833,210	7,465,838,040
Total world merchandise imports	5,155,407,570	5,393,792,380	5,577,934,310	5,528,389,420	5,760,745,280	6,539,390,000	6,304,380,130	6,567,275,000	7,646,613,900
Total Chile merchandise exports	16,446,500	15,546,100	16,654,100	15,077,200	17,170,100	19,205,700	18,393,600	18,435,800	21,254,900
Total Chile merchandise imports	15,348,300	17,823,500	19,663,400	18,779,000	15,805,200	18,445,400	17,783,500	17,179,900	19,325,900

Source: FAOSTAT, 2005

Appendix B.15 Chile grape products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Grapes export value	345,343	429,390	413,954	403,424	406,920	523,545	460,185	658,808	708,363
Grapes import value	0	0	297	215	90	25	22	23	26
Grape juice export value	22,170	27,018	12,498	24,166	7,067	7,740	13,471	11,784	12,908
Grape juice import value	3,499	2,104	1,212	802	707	493	548	2,266	3,189
Raisins export value	30,789	34,410	41,555	37,243	45,678	48,671	38,712	39,327	42,136
Raisins import value	0	1	4	41	0	13	20	73	30

Source: FAOSTAT, 2005

Appendix B.16 Chile apple products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apples export value	197,176	223,273	189,581	233,443	229,301	181,705	236,203	279,345	265,133
Apples import value	0	3	83	162	111	45	44	0	17
Apple juice export value	0	0	0	0	0	0	0	0	8
Apple juice import value	120	335	0	0	0	0	0	14	14
Concentrated apple juice export value	52,386	67,138	47,498	29,878	58,062	45,733	50,963	34,495	44,149
Concentrated apple juice import value	0	0	159	85	114	62	36	20	6

Source: FAOSTAT, 2005

Appendix B.17 Chile pears export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pears export value	58,475	73,192	73,749	68,751	71,573	57,118	57,874	59,500	68,004
Pears import value	-	-	-	-	-	40	-	12	0

Source: FAOSTAT, 2005

Appendix B.18 Chile apricot products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Apricots export value	2,801	3,037	1,691	3,685	2,731	3,800	3,346	4,400	3,801
Apricots import value	0	0	0	0	0	0	0	0	0
Dried apricots export value	138	109	1	6	106	71	75	137	16
Dried apricots import value	17	60	35	65	9	40	63	89	144

Source: FAOSTAT, 2005

Appendix B.19 Chile nectarines and peaches export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peaches & nectarines export value	60,806	71,530	57,316	48,083	62,900	60,457	71,765	84,003	91,304
Peaches & nectarines import value	0	0	0	0	0	20	10	0	0

Source: FAOSTAT, 2005

Appendix B.20 Chile plum products export and import values (1000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Plums export value	41,226	51,506	49,544	43,104	60,474	46,691	64,663	72,300	71,314
Plums import value	0	0	24	0	0	0	0	0	0
Dried plums export value	25,587	21,933	19,822	21,146	24,479	28,155	35,038	35,427	38,877
Dried plums import value	150	113	7	10	31	56	2	296	1,335

Source: FAOSTAT, 2005